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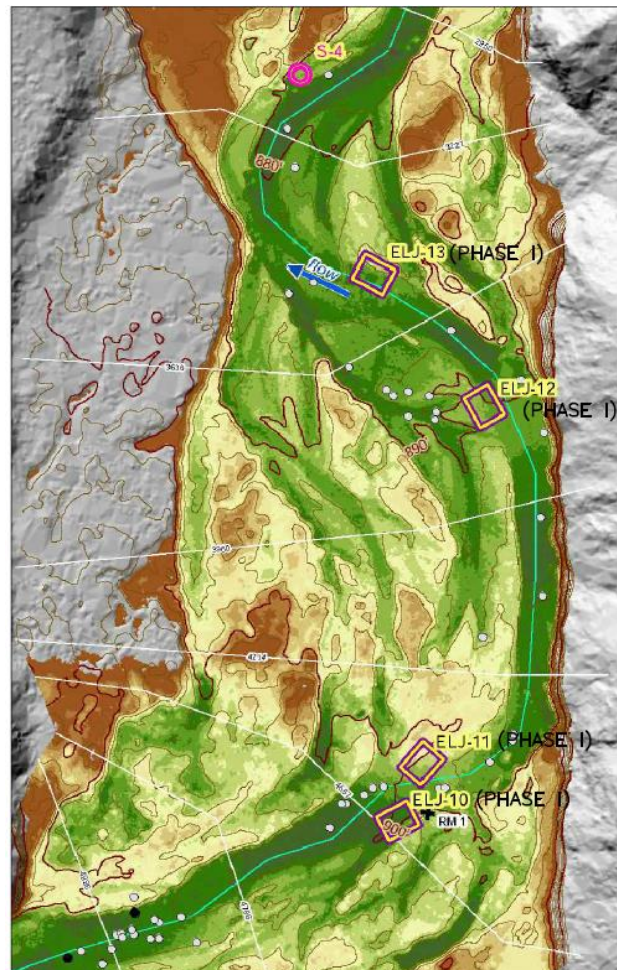
Pacific
Northwest
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April 2016



Environmental Assessment for the Dungeness Large Wood Enhancement Project

Olympic National Forest
Clallam County, Washington



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SUMMARY

The Olympic National Forest and the Jamestown S’Klallam Tribe are proposing to implement a restoration project to improve fish habitat within the Dungeness and Gray Wolf Rivers. Log jams would be constructed in four separate reaches of the Dungeness and Gray Wolf Rivers on National Forest System lands, between river mile (RM) 13.4 to 14.2 on the Dungeness River and RM 0.4 to 2.0 on the Gray Wolf River. Approximately 15 strategically located log jams will be placed along the four reaches of the rivers. Three existing log jams would also be stabilized. Log jams would be constructed from trees and materials delivered to the river channel by helicopter. No excavation or recontouring of the streambed or channel with heavy machinery would occur. This action would occur in Clallam County within the Middle Dungeness River and Lower Gray Wolf River subwatersheds.

The proposed floodplain and river restoration on the Dungeness and Gray Wolf Rivers would be designed to accelerate the recovery of channel processes, and improve fish habitat. Three fish species listed as threatened under the federal Endangered Species Act (ESA) are present in the project area within the Dungeness watershed: Puget Sound Chinook, Puget Sound steelhead, and Olympic Peninsula bull trout. Returning numbers of all listed fish species are chronically low. Habitat restoration in the Dungeness River is identified as a key recovery action in the recovery plan for Puget Sound Chinook. Large wood additions to the river channels are specifically identified as a priority habitat improvement within The North Olympic Peninsula Lead Entity’s 2012 Three-Year Work Plan. Large wood placement in the Dungeness and Gray Wolf Rivers is also identified as a priority restoration action in the Draft Collaborative Restoration Plan (USDA Forest Service, 2011) and in the Watershed Restoration Action Plan for the Middle Dungeness subwatershed (USDA Forest Service, 2012).

Approximately 120 second growth trees would be needed to provide the necessary large woody material for the project. Trees ranging from 18 to 27 inches in diameter would be removed from up to a total of two acres of second-growth forest stands in the Adaptive Management Area land management allocation, within the Middle Dungeness River subwatershed. There are six potential wood source units within the Canyon Creek drainage, off FSR 2878, varying in size from 0.1 to 0.5 acre. Most of the trees would be pushed over with an excavator and removed with their roots attached. Some of the trees would be felled by chainsaw. Tree removals would create a variety of small openings. All tree removals would be coordinated with wildlife and silviculture specialists to accomplish multiple objectives and minimize resource impacts. No road construction would occur.

Forest Service personnel have conducted this environmental analysis of the proposed project as required by the National Environmental Policy Act (NEPA). You may view project information at the following website: http://www.fs.fed.us/nepa/nepa_project_exp.php?project=43811.

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CHAPTER 1 – INTRODUCTION

Relationship to the Forest Plan and other Management Direction

The Olympic National Forest has prepared this Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) of 1969 and its implementing regulations at 40 CFR 1500-1508, as well as those requirements established by Federal environmental laws and regulations. This EA is consistent with 36 CFR 220, which establishes Forest Service procedures for compliance with NEPA.

Forest Plan

This Environmental Assessment is tiered to the Final Environmental Impact Statement (FEIS) for the Olympic National Forest Land and Resource Management Plan (USDA Forest Service 1990), as amended. The 1990 Olympic National Forest Land and Resource Management Plan (Forest Plan) guides all natural resource management activities and establishes management Standards and Guidelines for the Olympic National Forest.

Major plan amendments include:

The Final Supplemental Environmental Impact Statement (FSEIS) on Management of Habitat for Late Successional and Old-growth Forest Related Species Within the Range of the Northern Spotted Owl (USDA Forest Service and USDI Bureau of Land Management 1994a) as adopted and modified by the April 1994 ROD for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl, provides additional standards and guidelines (USDA Forest Service and USDI Bureau of Land Management 1994b). These two documents are commonly referred to collectively as the Northwest Forest Plan (NWFP). The 1994 ROD added land allocations to the allocations in the 1990 Land and Resource Management Plan. The standards and guidelines it established for these land allocations supersede management direction in the 1990 Forest Plan unless the 1990 Forest Plan is more restrictive or provides greater benefits to late-successional forest related species. The key elements of the Northwest Forest Plan are they system of Riparian and Late Successional Reserves, the Aquatic Conservation Strategy, and various standards and guidelines affecting each of the land allocations.

Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA USDI 2001). The Northwest Forest Plan included mitigation measures for management of known sites, site-specific pre-habitat disturbing surveys, and/or other landscape scale surveys for about 400 rare and/or isolated species. These are species that due to rarity or lack of information it was uncertain as to whether they would be adequately protected by the other elements authorized in the 1994 NWFP ROD. The standards and guidelines for these mitigation measures are known as Survey and Manage, Protection Buffers, and Protect Sites From Grazing. Survey and Manage species are addressed further in the section below.

In this EA, the term “Forest Plan” refers to the 1990 Forest Plan as amended by the 1994 ROD and other amendments currently in effect. The Dungeness Large Wood Enhancement Project is consistent with Forest Plan standards and guidelines.

The Northwest Forest Plan (NWFP) land allocations within the project area are as follows:

- a) Adaptive Management Areas (AMA): The objective of this land allocation is to encourage the testing of innovative approaches to integrating ecological, economic and other social and community objectives. All wood source units are within the AMA.
- b) Late-Successional Reserves (LSR): The objective of this land allocation is to protect and enhance conditions of late-successional and old-growth forest ecosystems. The project area is within the Quilcene LSR (RW106).
- c) Riparian Reserves (RR): This allocation consists of portions of watersheds where riparian-dependent resources receive primary emphasis, which are required for maintaining hydrologic, geomorphic, and ecological processes that directly affect waterbodies. All proposed log jams and stabilization of log jams are within this allocation, which overlays AMA and LSR allocations
- d) Key Watershed: This is a component of the Northwest Forest Plan’s Aquatic Conservation Strategy (ACS) and is a system of large refugia comprising watersheds that are crucial to at-risk fish species and provide high quality water. The Dungeness watershed is a Tier 1 Key Watershed.

The NWFP land allocations are displayed in Figure 1-2 (see page 5). This project would help meet the objectives of these allocations by improving overall aquatic habitat conditions. Project activities associated with removal of trees would take place in the Adaptive Management Area. Project activities associated with the log jams would take place in Riparian Reserves within the Late Successional Reserve allocation.

1990 Forest Plan land allocations within the watershed are displayed in Figure 1-3. Project activities would take place within the Municipal Watershed-F1 management area of the 1990 Forest Plan. The project activities are in compliance with the standards and guidelines associated with this management allocation. Portions of both the Gray Wolf and the Dungeness Rivers upstream from the project activity areas are recommended Wild, Scenic, and Recreational Rivers. A portion of the Gray Wolf River where log jams are proposed falls within the Quilcene unroaded area (inventoried roadless area; IRA). Chapter 3 provides a discussion of the project’s anticipated effects to these land management areas.

Survey and Manage

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in *Conservation Northwest, et al. v. Sherman, et al.*, No. 08-1067-JCC (W.D. Wash.), granting Plaintiffs’ motion for partial summary judgment and finding NEPA violations in the *Final Supplemental to the 2004 Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* (USDA and USDI, June 2007). In response, parties entered

into settlement negotiations in April 2010, and the Court filed approval of the resulting Settlement Agreement on July 6, 2011. Projects that are within the range of the northern spotted owl are subject to the survey and management standards and guidelines in the 2001 ROD, as modified by the 2011 Settlement Agreement.

On December 2009, the District Court for the Western District of Washington issued an order on partial summary judgment in favor of the Plaintiffs finding inadequacies in the NEPA analysis supporting the *Record of Decision to Remove the Survey and Manage Mitigation Measure Standards and Guidelines from Bureau of Land Management Resource Management Plans Within the Range of the Northern Spotted Owl* (FS et al. 2007)(2007 ROD). The District Court did not issue a remedy or injunction at that time.

Plaintiffs and Defendants entered into settlement negotiations that resulted in the 2011 Survey and Manage Consent Decree, adopted by the District Court on July 6, 2011.

The Defendant-Intervenor subsequently appealed the 2011 Consent Decree to the Ninth Circuit Court of Appeals. The April 25, 2013 ruling in favor of Defendant-Intervener remanded the case back to the District Court.

On February 18, 2014, the District Court vacated the 2007 RODs. Vacatur of the 2007 RODs has the result of returning the Forest Service to the status quo in existence prior to the 2007 RODs.

The Dungeness Large Wood Project is consistent with the 1990 Olympic National Forest Forest Plan as amended by the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (2001 ROD), as modified by the 2011 Settlement Agreement.

The Dungeness Large Wood Enhancement Project applies a 2006 Exemption from a stipulation entered by the court in litigation regarding Survey and Manage species and the 2004 Record of Decision related to Survey and Manage Mitigation Measure in *Northwest Ecosystem Alliance v. Rey*, No. 04-844-MJP (W.D. Wash., Oct. 10, 2006). Previously, in 2006, the District Court (Judge Pechman) invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations. Following the District Court's 2006 ruling, parties to the litigation entered into a stipulation exempting certain categories of activities from the Survey and Manage standards and guidelines, including both pre-disturbance surveys and known site management. Also known as the Pechman Exemptions, the Court's Order from October 11, 2006 directs:

"Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:

- a. *Thinning projects in stands younger than 80 years old;*
- b. *Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;*

- c. *Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement [of] large wood, channel and floodplain reconstruction, or removal of channel diversions; and*
- d. *The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old under subparagraph a. of this paragraph.”*

Per the 2011 Settlement Agreement, the 2006 Pechman Exemptions remain in force:

“The provisions stipulated to by the parties and ordered by the court in Northwest Ecosystem Alliance v. Rey, No. 04-844-MJP (W.D. Wash. Oct. 10, 2006), shall remain in force. None of the following terms or conditions in this Settlement Agreement modifies in any way the October 2006 provisions stipulated to by the parties and ordered by the court in Northwest Ecosystem Alliance v. Rey, No. 04844-MJP (W.D. Wash. Oct. 10, 2006).”

The Dungeness large Wood Enhancement Project meets Exemption c above because it is a stream improvement project that entails riparian planting, the placement of large wood, channel and floodplain reconstruction, and removal of channel diversions.

Other Management Direction

This EA also tiers to the following:

- *Olympic National Forest Final Environmental Impact Statement and Record of Decision – Beyond Prevention: Site-Specific Invasive Plant Treatment* (USDA Forest Service 2008).

This document amended the ONF Forest Plan and authorized site-specific treatment of infestations of non-native invasive plant species on the Olympic National Forest.

The following ONF assessments were referenced in this document:

- The *1995 Dungeness River Watershed Analysis* (USDA Forest Service 1995). Watershed analysis is required under the Northwest Forest Plan. The Dungeness River Watershed Analysis characterizes and discusses the environmental and social conditions within the watershed, and contains recommendations for restoration.
- The *Quilcene Late Successional Reserve Assessment (LSRA)* (USDA Forest Service 1996). The LSRA describes the history and conditions within the Quilcene Late Successional Reserve (LSR) and identifies management opportunities to facilitate the achievement of LSR objectives.

Habitat restoration in the Dungeness River is identified as a key recovery action in the recovery plan for Puget Sound Chinook (Shared Strategy for Puget Sound (SSPS) 2007). Large wood additions to the river channel have specifically been identified as a priority habitat improvement within the North Olympic Peninsula Lead Entity (NOPE) for Salmon, 2013 Three-Year Work Plan. Large wood restoration in the Dungeness ranked 13 out of 84 projects identified on the Northern Olympic Peninsula (NOPE 2013). The addition of large

wood to the stream channel as a restorative step to improve fish habitat in the mid-watershed was also identified in the second iteration of the Dungeness Watershed Analysis (USDA Forest Service 1999).

Additional documentation may be found in the project planning record located at the Olympic National Forest Headquarters in Olympia, Washington.

The project record and all references cited are hereby incorporated by reference into this Environmental Assessment.

Project Location

This action would occur within the Dungeness Watershed, specifically the Middle Dungeness River and Lower Gray Wolf River subwatersheds. The project area is located on the Hood Canal Ranger District of the Olympic National Forest, in Clallam County, Washington. The legal location of the project is: T29N, R3W, Sections 19, 30, 31, and T29N, R4W, Sections 24, 27, 36, Willamette Meridian. The two main reaches on the Dungeness River are at approximately RM 13.4, along the Olympic National Forest boundary, and RM 14.2. Reaches along the Gray Wolf River are from RM 0.4 to RM 0.8, above the Dungeness Forks Campground and below the 2870 bridge, and from RM 1.8 to RM 2.0, at the Cat Creek confluence (Figure 1-1).

Figure 1-1. Project vicinity map.

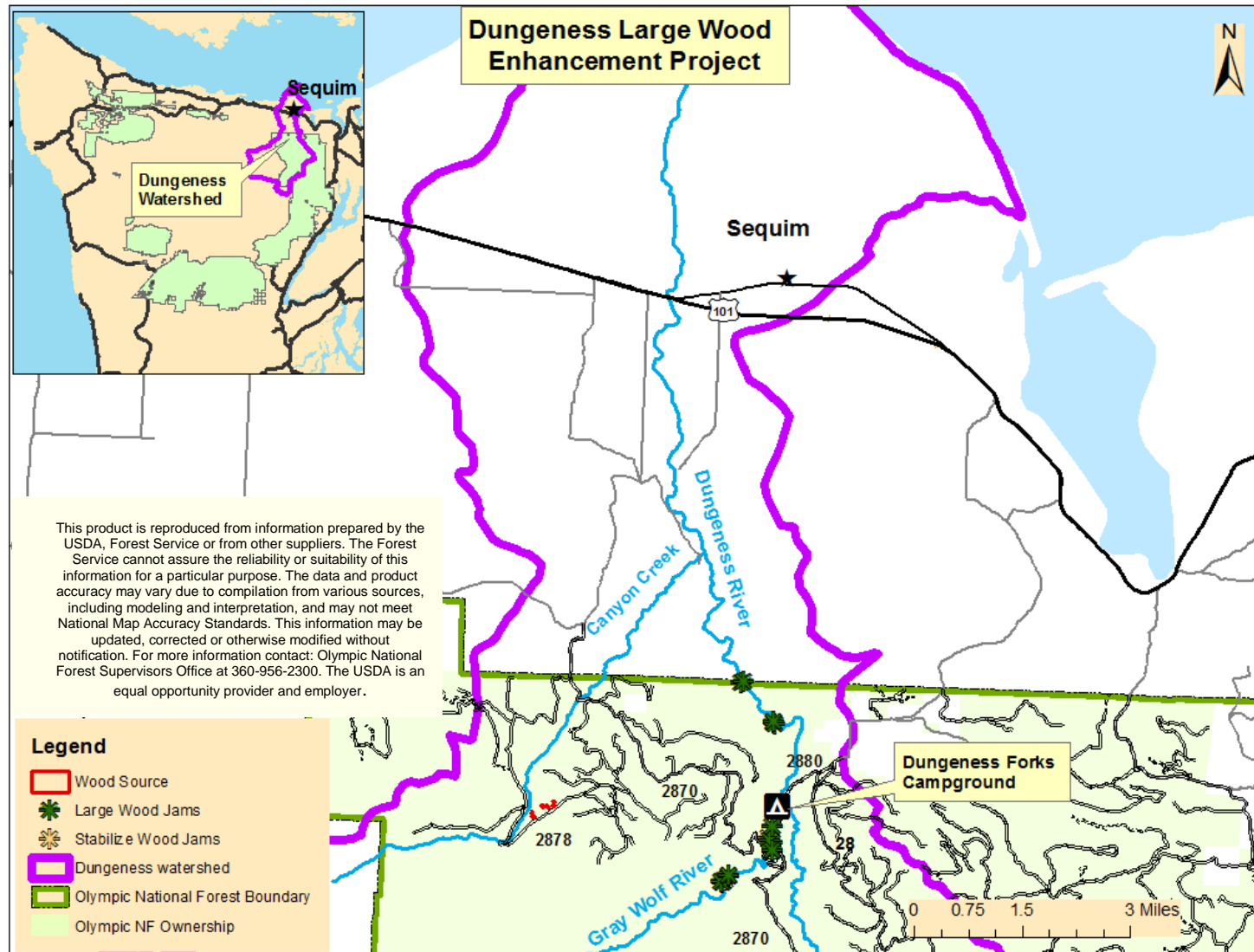


Figure 1-2. Northwest Forest Plan land management allocations.

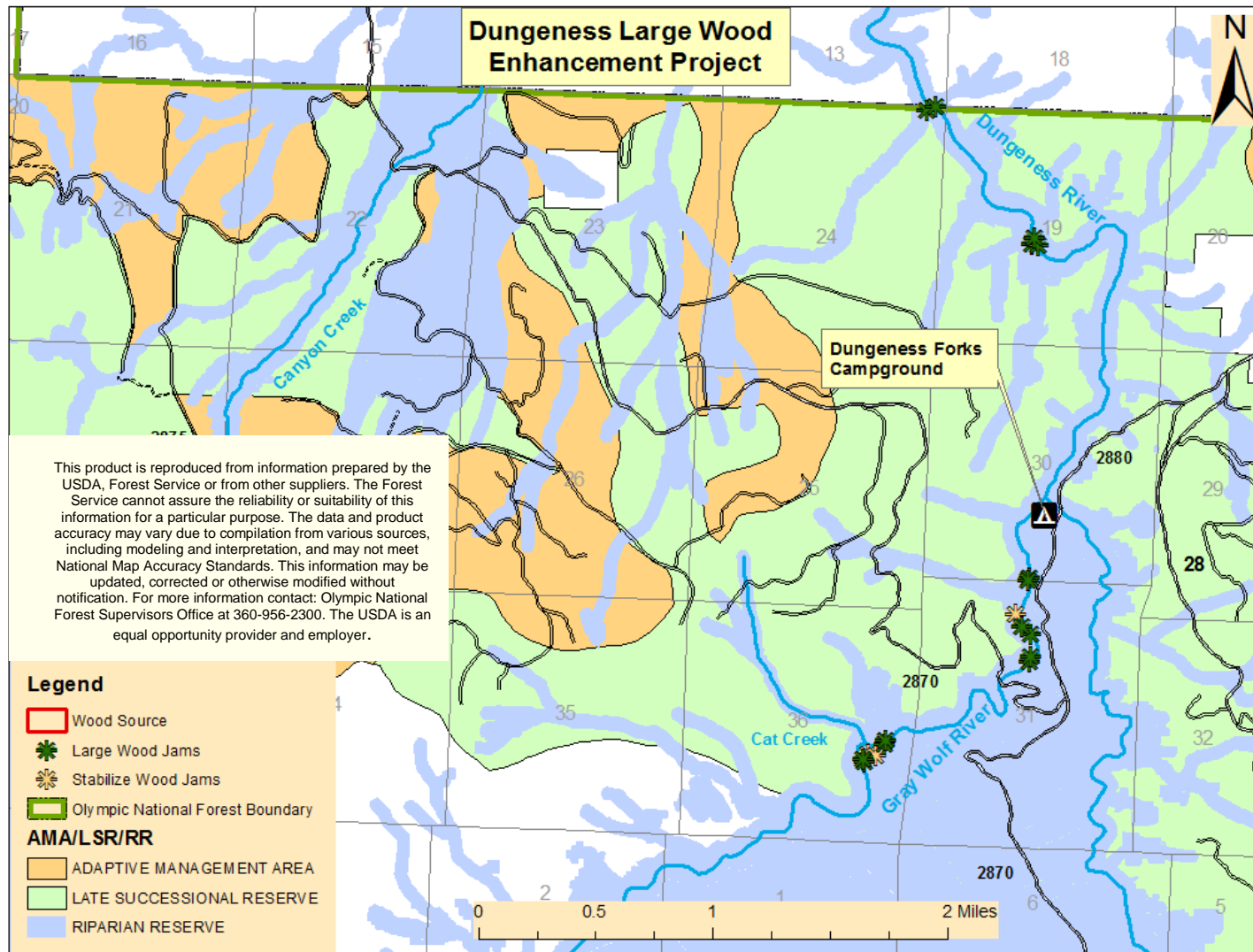
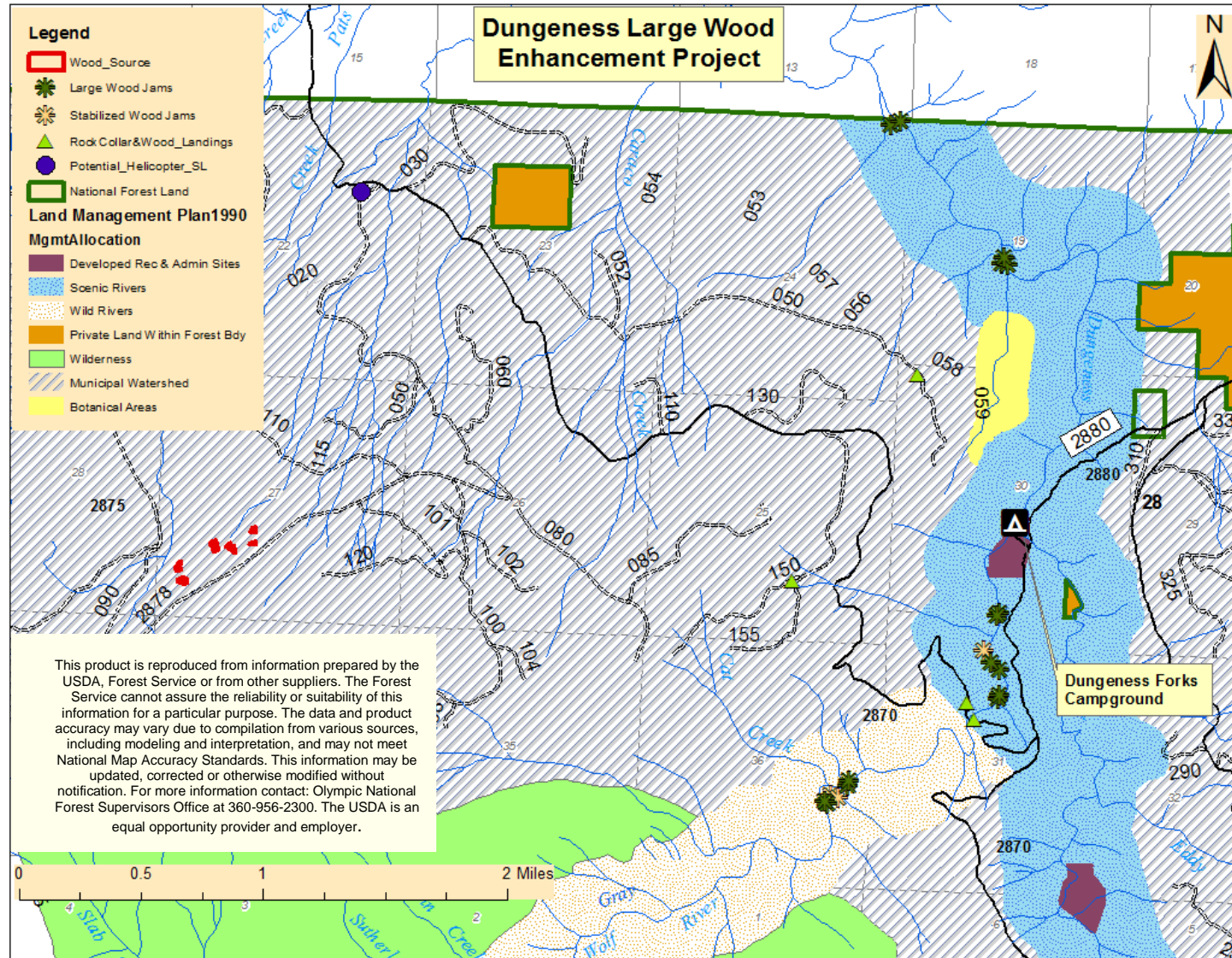


Figure 1-3. 1990 Land and Resource Management Plan management area allocations.



Background

Dungeness Watershed

Per the USDA's 1995 Dungeness Watershed Analysis, the Dungeness Watershed lies in the northeast corner of the Olympic Peninsula of Washington and consists of 179,300 acres including both public and privately owned lands. The Dungeness River begins with snow fields on the southeast face of Mt. Mystery and flows through the foothills across the Sequim-Dungeness Valley, and enters the Strait of Juan de Fuca just west of the community of Sequim. The Gray Wolf River is the largest tributary of the Dungeness River.

Federal and State agencies including the National Park Service, USDA Forest Service and Washington State Department of Natural Resources (WA DNR) manage more than 50 percent of the watershed. The privately held land in the watershed is generally contained in large holdings for timber production. In recent years, many timber lands have changed hands and forest lands are being converted to residential and other uses in developing areas. The lower Dungeness watershed has largely been converted to rural, agricultural, and urban uses.

The headwaters of both the Dungeness and Gray Wolf Rivers flow out of the Olympic National Park (ONP) and through the Buckhorn Wilderness area on the Olympic National Forest. Both the ONP and the wilderness area, which are above the proposed project areas, have seen little human disturbance, therefore headwater riparian areas and aquatic habitat conditions are relatively pristine.

The Dungeness Watershed is designated as a Tier I Key Watershed under the Northwest Forest Plan due to the presence of crucial refugia for at-risk fish species. There is an expectation that the watershed will continue serve as a refugia and be an anchor for recovery of at-risk salmonid stocks. Restoring degraded habitat conditions is a high priority in Key Watersheds.

In 2010 The Olympic National Forest designated the Dungeness as one of three "Focus Watersheds" to emphasize aquatic restoration because of the potential to contribute to recovery of ESA listed fish species. In 2012 the Forest designated the Middle Dungeness subwatershed as one of four "Priority Watersheds" for restoration under the national Watershed Condition Framework program.

Management History

Natural fires and timber harvest have been the two primary disturbance factors in the middle watershed, where the project reaches are located. The natural fire return interval for the east side of the Olympic Peninsula is approximately 200 years. The most recent large wildfire occurred in 1701. Since that time, several smaller fires have occurred in portions of the watershed (USDA Forest Service 1995; USDA Forest Service 1999). Natural fire history is pertinent to the project because of the interaction between fire and instream large wood. Stand-replacing fires can kill large trees that could eventually, through landslides, windthrow, and other natural processes, enter fish-bearing streams and function as important

components of fish habitat. However, fire-killed trees can and do enter streams and function as large wood. Stand-replacing fire temporarily reduces the local availability of new in-stream wood as the burned source stand regrows. Natural fire on the Olympic Peninsula is typically patchy. With the exception of infrequent large stand replacing fires, fire history, while it may result in shifting patterns of large wood availability over time, is unlikely to have had much negative influence on fish habitat in the Dungeness Watershed. Fire has had a minor impact in recent years with little activity (USDA Forest Service 1999).

Human activities and timber harvest have had a considerable influence on instream habitat in the project area. Logging in the Dungeness Watershed began around the 1850s when the area began to be settled by humans. The lower Dungeness Watershed has largely been converted to rural, agricultural, and urban uses. Industrial timber harvesting (clearcutting and commercial thinning) began in the lowlands and montane areas in approximately 1940, and has occurred unevenly across the watershed. Timber harvest has been drastically reduced on National Forest System lands since 1994, when the management emphasis changed from resource extraction to restoration.

Fish Presence

Three fish species listed as threatened under the federal Endangered Species Act (ESA) are present in the project area within the Dungeness watershed: Puget Sound Chinook, Puget Sound steelhead, and Olympic Peninsula bull trout. Returning numbers of all listed fish species are chronically low.

Chinook Salmon

For the last 10 years natural-origin Chinook in the Dungeness have been well below the low abundance threshold of 500 returning fish set by WDFW and the Tribes (WDFW Chinook website), see Table 1-1 below.

Table 1-1. Numbers of returning Chinook salmon in the Dungeness River.		
Year	Natural-Origin Spawners	Hatchery-Origin Spawners
2004	182	771
2005	304	651
2006	293	1112
2007	146	159
2008	86	54

Table 1-1. Numbers of returning Chinook salmon in the Dungeness River.		
Year	Natural-Origin Spawners	Hatchery-Origin Spawners
2009	71	57
2010	76	269
2011	83	452
2012	212	296
2013	46	122
2014	21	87

Steelhead

The WDFW does not conduct steelhead redd surveys in the Dungeness River due to the challenges of high flows and poor visibility of the Dungeness and Gray Wolf Rivers in the spring.

Bull trout

The Olympic National Forest conducted a bull trout telemetry study in the Dungeness and Gray Wolf Rivers between 2003 and 2006 to identify migration patterns and spawning and rearing habitats. The Forest also conducted bull trout redd surveys.

The majority of bull trout spawning in the Dungeness River watershed occurred within the Gray Wolf River. Almost 75 percent of the tagged fish moving onto spawning grounds migrated into the Gray Wolf. Two thirds of all bull trout redds found in the Dungeness watershed in 2004 were observed in the Gray Wolf River.

Almost all of the bull trout spawning in the Gray Wolf River occurred between River Mile 1.0 and 8.5. Heavily utilized spawning areas typically had relatively wide valley bottoms with well developed floodplains and side channels. Many of the bull trout redds in the upper Gray Wolf were located within four side channels.

Bull trout redds were observed throughout the middle Dungeness River from the confluence with the Gray Wolf at RM 15.75 to the anadromous barrier at RM 19.0. Several of the redds were found on or near engineered rock and log weirs that were placed in the channel as a fish habitat restoration project in the late 1980s. Bull trout spawning activity also occurred around the confluence of the Dungeness and Gray Wolf Rivers in mid to late December. Most of the bull trout in this later group spawned within about one half mile of the confluence.

Table 1-2. 2004-2010 Total bull trout redds observed in the Dungeness and Gray Wolf Rivers.

Year	2004	2005	2006	2007	2008	2009	2010
Total redds observed	52	19	16	22	12	20	7

Fish Habitat in the Dungeness Watershed

An understanding of the post-glacial evolution of forest/river ecosystems of western Washington that are relevant to understanding the historic conditions of the Dungeness Watershed include the establishment of western red cedar, western hemlock and Douglas-fir. Before this, between 14,000 and 8,700 years ago, rivers bisecting the newly exposed landscape were characterized by high erosion and sediment yields. While salmon habitat was probably abundant during this period, the high erosion rates made those habitats low quality and unstable. Around 6,000 years ago, forests had matured and old growth forest was a large component of the watershed. Salmon habitat improved and stabilized in the Dungeness River due to decreasing sediment yields and large woody debris provided by the old growth forest. There is indirect evidence that current conditions of the river are different from historic conditions in ways that are critical for the survival of salmon. For example, historically there was more rearing habitat with greater depth (of pools) and more cover (from large wood debris), a lower summer water temperature regime, easier adult access to upstream areas during low flows, and a more stable set of spawning conditions in the streambed. The river appears to be returning to an earlier less stable and less productive condition. Sediment deposition is a natural process, however, when the amount of sediment deposited exceeds the stream's ability to transport it, the stream channel changes in ways that are detrimental to salmon habitat.

Ecosystem processes that have historically acted in this river system to create ideal habitats for spawning and rearing salmon have been compromised by past land-use activities in the managed portion of the watershed such as extensive logging of riparian and upland forests, clearing for agriculture and development, road construction, and clearing instream woody debris from the channel. On National Forest System lands, within the proposed project area, land management direction emphasizes restoration of terrestrial and aquatic systems.

Fish habitat conditions in the managed portion of the Dungeness Watershed are currently limited by a lack of stable large wood jams in the river channel which inhibits key habitat-forming processes and limits the development and maintenance of high quality spawning and rearing habitat. Aquatic habitat conditions should eventually improve over time as trees grow in the riparian area and fall into the river, but the small size of the majority of existing trees and the high proportion of hardwoods in the riparian area would preclude any meaningful improvement within the foreseeable future.

The Dungeness Watershed is designated as a Tier I Key Watershed under the Northwest Forest Plan due to the presence of crucial refugia for at-risk fish species. There is an expectation that the watershed will continue to serve as a refugia and be an anchor for recovery of at-risk salmonid stocks. Restoring degraded habitat conditions is a high priority in Key Watersheds.

In 2010 The Olympic National Forest designated the Dungeness as one of three “Focus Watersheds” to emphasize aquatic restoration because of the potential to contribute to recovery of ESA listed fish species. In 2012 the Forest designated the Middle Dungeness subwatershed as one of four “Priority Watersheds” for restoration under the national Watershed Condition Framework program.

Importance of Large Wood for Fish Habitat

Large wood (often called large woody debris, or LWD) is a fundamental element of the process of fish habitat creation and maintenance of that habitat. The importance of large, stable log jams in creating and maintaining fish habitat in large river systems is well documented (Sedell et al 1988; Pearsons et al. 1992; Naiman et al. 2000; Kaufmann and Hughes 2006). Some of the key functions of large wood include deflecting flow, dissipating energy, creating local scour pools, sorting and storing sediment and gravels, increasing local water surface elevation, and providing in-stream cover; all of which increase in-stream channel and habitat complexity.

The absence of large, stable log jams leads to simplification of instream structure, and has contributed to the reduction or loss of salmonid habitat characteristics such as diversity of in-channel habitat, number of pools, amount of pool area, the proportion of pools with complex cover, and the amount and distribution of spawning gravels.

Because of the direct correlation between the amount of stable instream large wood and quantity and quality of fish habitat and the relative shortage of stable instream wood or riparian trees that are large enough to form stable instream wood complexes within the near future, there is a need to add large wood to the stream channel as a restorative step to improve fish habitat.

Over the past decade, numerous large wood placement and engineered log jam projects have successfully improved fish habitat in rivers across the Olympic Peninsula, such as the Elwha, Hoh, Quinault, South Fork Skokomish, and Dosewallips Rivers. A previous Engineered Log jam project was constructed in the lower Dungeness River by the Jamestown S’Klallam Tribe in 2007 and 2008. A series of log and rock weirs were placed in the Dungeness River above the old East Crossing campground in the late 1980s.

Management History

Natural fires and timber harvest have been the two primary disturbance factors in the middle watershed, where the project reaches are located. The natural fire return interval for the east side of the Olympic Peninsula is approximately 200 years. The most recent large wildfire occurred in 1701. Since that time, several smaller fires have occurred in portions of the watershed (USDA Forest Service 1995; USDA Forest Service 1999). Natural fire history is

pertinent to the project because of the interaction between fire and instream large wood. Stand-replacing fires can kill large trees that could eventually, through landslides, windthrow, and other natural processes, enter fish-bearing streams and function as important components of fish habitat. However, fire-killed trees can and do enter streams and function as large wood. Stand-replacing fire temporarily reduces the local availability of new instream wood as the burned source stand regrows. Natural fire on the Olympic Peninsula is typically patchy. With the exception of infrequent large stand replacing fires, fire history, while it may result in shifting patterns of large wood availability over time, is unlikely to have had much negative influence on fish habitat in the Dungeness Watershed. Fire has had a minor impact in recent years with little activity (USDA Forest Service 1999).

The Gray Wolf River above River Mile 3 and the Dungeness River headwaters above River Mile 25 lie within the Olympic National Park and the Buckhorn Wilderness area. Little human activity has occurred in these undeveloped areas and both instream habitat and riparian vegetation conditions are relatively pristine.

Human activities and timber harvest have had a considerable influence on instream habitat in the managed portion of the watershed. Logging in the Dungeness River watershed began around the 1850's when the area began to be settled by humans. Industrial timber harvesting began in the lowlands and montane areas in approximately 1940, and has occurred unevenly across the watershed. Timber harvest has been drastically reduced on National Forest System lands since 1994, when the management emphasis changed from resource extraction to restoration. The lower Dungeness watershed has largely been converted to rural, agricultural, and urban uses.

Purpose and Need

Existing Condition

The Dungeness Watershed Analysis (USDA Forest Service 1995) found that the following fish habitat elements were functioning “at risk:”

- Large woody debris (LWD)
- Pool frequency and quality
- Large pools
- Off-channel habitat for fish needing overwintering habitat (coho, steelhead)
- Refugia for all species

Riparian areas on National Forest System lands within the managed portion of the Dungeness Watershed are slowly recovering as trees grow and some of the hardwood dominated stands convert back to conifers. However, many of the existing riparian stands on NFS lands are young, small-diameter trees or hardwoods that, even if recruited into the river, are not large enough to form stable log jams in a river the size of the Dungeness and Gray Wolf Rivers.

Because of past timber harvest in riparian areas along the Dungeness and lower Gray Wolf Rivers, the growth and recruitment of the extremely large trees that have the capability to form key structures in stable log jams will continue to be below natural levels for the foreseeable future. The general trend of relatively small wood pieces racking up into transient log jams that disappear or shift positions frequently has been consistent within the watershed for at least the past decade.

Desired Condition

The desired condition for the project reaches is to reestablish appropriate and intact habitat-forming processes, including the creation and maintenance of stable instream large wood complexes. This would result in a high degree of instream complexity that provides a diversity of habitats for large and well-distributed populations of fish and other aquatic species. The reaches would contain an abundance of large wood, and deep pools with high levels of complex hiding cover. Gravel would be the predominant substrate. The river and tributary streams would frequently overflow their banks and spread out into their floodplains. While streams and fish habitat are dynamic and change over time, the hydrologic, geomorphic, and ecological processes within the watershed would contribute to self-sustaining fish habitat conditions.

Purpose and Need

This purpose and need of the project was developed to close the gap between the existing condition and the desired condition as discussed above. Habitat restoration in the Dungeness River is identified as a key recovery action in the recovery plan for Puget Sound Chinook. Large wood additions to the river channel have specifically been identified as a priority habitat improvement, within The North Olympic Peninsula Lead Entity's 2012 Three-Year Work Plan. Large wood enhancement in the Dungeness and Gray Wolf Rivers has also been identified in the Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout. Large wood placement in the Dungeness and Gray Wolf Rivers is identified as a priority restoration action in the Draft Collaborative Restoration Plan (USDA Forest Service, 2013) and in the Watershed Restoration Action Plan for the Middle Dungeness subwatershed (USDA Forest Service, 2012).

The primary objective for the Dungeness River Large Wood Enhancement Project is to improve habitat for Endangered Species Act (ESA) listed salmon, steelhead, and bull trout by increasing in-stream complexity, and improving the following habitat elements:

1. Channel length and edge habitat
2. Pool frequency
3. Stability and retention of organic debris
4. In-stream cover
5. Sorting and stability of streambed substrate
6. Floodplain connectivity (frequency of side channel and overbank inundation)

We propose to construct a set of strategically placed log jams to simulate natural log jams that used to be common in the Dungeness Valley. Recreating stable, functional large wood in the river system (Abbe & Montgomery 1996, Abbe et al 2003a) through construction of strategically placed log jams, which will maximize the habitat forming benefits of deflecting flow, creating local scour pools, sorting in-stream sediment, locally increasing water surface elevation, and providing in-stream cover; all of which increase in-stream channel and habitat complexity. The constructed log jams will provide persistent habitat over time as the channel continues to evolve (Abbe et al. 2003).

Public Involvement

Scoping for this project was initiated on April 1, 2014 by listing this project in the Forest's Schedule of Proposed Actions (SOPA). Letters of consultation were mailed to the Jamestown S'Klallam Tribe, Port Gamble S'Klallam Tribe, and the Lower Elwha S'Klallam Tribe on August 27, 2014. Scoping letters were sent to the general public on September 19, 2014. These letters described the Proposed Action and provided the opportunity to respond to the proposal. Five written comments were received during scoping.

Public comments from scoping were reviewed to identify issues. The following themes emerged from the scoping comments:

Safety Concerns:

- Concern about the downstream effects of potential failure.
- Concerns about safety and monitoring of the rock collar structures.
- Concern that the in-stream structures create safety hazards for river users.

Design and effectiveness concerns:

- Concern as to how log jam locations were determined.
- Concern about long-term survival and effectiveness of the structures in meeting the project objectives.
- Concern about the trees proposed for removal and use in the log jams and their effectiveness as log jams.

All of these concerns were considered and are addressed or otherwise described in the design of the proposed Dungeness Large Wood Enhancement project, associated mitigation measures, and post-implementation monitoring (see Chapter 2). No issues raised during scoping led to the development of additional action alternatives to the proposed action.

Objection Process (36 CFR 218 Objection Regulations)

Section 428 of the consolidated appropriations Act of 2012 included a provision establishing a pre-decisional objection process (36 CFR 218) for projects and activities implementing

land management plans in lieu of the post-decisional appeal process (36 CFR 215) used by the agency since 1993. This project is subject to a project-level pre-decisional administrative review process (Objection Process) as identified in 36 CFR 218, subparts A and B.

Rather than being able to seek higher-level review of unresolved concerns after a project decision has been made under the former Appeal process, those who are eligible will be able to seek that review before the project decision has been signed under 36 CFR 218. The Forest Service believes that considering public concerns before a decision is made aligns with our collaborative approach to public land management and increases the likelihood of resolving those concerns resulting in better, more informed decisions. The Forest Service also believes this will aid in our efforts to be more efficient with documenting environmental effects (NEPA).

Opportunity for public comment on this project includes scoping, and this 30-day comment period on the preliminary environmental analysis. Individuals and entities (non-governmental organizations, businesses, partnerships, state and local governments, Alaska Native Corporations, and Indian Tribes) who submit timely, specific written comments regarding a proposed project or activity during any designated opportunity for public comment may file an objection.

Written comments are those submitted to the Responsible Official or designee during a designated opportunity for public participation provided for a proposed project. Specific written comments should be within the scope of the Proposed Action, have a direct relationship to the Proposed Action, and must include supporting reasons for the Responsible Official to consider.

CHAPTER 2 – ALTERNATIVES

Introduction

Title 36 of the Code of Federal Regulations (36 CFR 220), which establishes Forest Service procedures for compliance with NEPA and the Council on Environmental Quality (CEQ) regulations for implementing NEPA, was adopted on July 24, 2008. Under 36 CFR 220.7(2)(i), when there are no unresolved conflicts concerning alternative uses of available resources, an EA need only analyze the proposed action and proceed without consideration of additional alternatives. Under 36 CFR 220.7(2)(ii), an EA may document consideration of a no-action alternative through the effects analysis by contrasting the impacts of the proposed action and any alternative(s) with the current condition and expected future condition if the proposed action were not implemented. Because there are no unresolved issues, and because engineered log jams are considered the foremost means for addressing the project's purpose and need, this environmental analysis considers the proposed action and a no-action alternative.

Alternatives Considered But Eliminated From Detailed Study

Passive Restoration Only

Passive restoration of degraded ecosystems involves the removal or modification of human-caused disturbances that are resulting in degradation. Examples of passive restoration to improve fish habitat include restricting livestock access, road drainage improvements, fish passage improvements, controlling riparian and aquatic invasive species, removing artificial bank-hardening structures (riprap or bulkheads), and modifying land management practices such as agriculture or timber harvest. The intent of passive restoration is to remove barriers that impede restoration through natural processes. In general, active restoration, such as the construction of instream large wood structures, is recommended to complement passive restoration efforts, in cases where passive restoration will not bring about an acceptable level of recovery, such as where the continued presence of ecosystem limitations are delaying recovery (Kauffman et al. 1995; Nagayama and Nakamura 2010).

In the case of the Dungeness Large Wood Enhancement Project area, passive restoration is already being implemented through current land management practices, which emphasize habitat restoration over resource extraction. Clearcut timber harvest, harvest of large trees from riparian areas, and the removal of instream large wood no longer occur on National Forest System lands in the Dungeness Watershed – silvicultural practices now emphasize the development of old-growth forest conditions in both riparian and upslope habitats. However, the recovery of natural sources of large instream wood will take many decades, and perhaps centuries. Passive restoration efforts alone will not fully address the need identified for this project, which is restoring the natural riverine functions and processes associated with large, stable log jams. A passive-restoration-only alternative is effectively equivalent to the no-action alternative. Therefore, a passive-restoration-only alternative was eliminated from consideration in this environmental analysis.

Alternative Methods of Log Jam Construction

Several alternative methods to create the desired log jams were considered during the initial design process but they were not carried forward because they were not feasible or they potentially had substantial negative impacts on visual quality and aesthetics. Constructing the log jams with large, old-growth trees is not feasible in this instance. The size of trees that would be needed to form key pieces in stable log jams in rivers the size of the Dungeness and Gray Wolf are rare in accessible portions of the watershed. Even if they were available, transporting full-size old-growth trees with rootwads to the project sites is not possible with the helicopters or trucks currently available. Constructing the log jams with heavy equipment and burying a large portion of the jams to create stability similar to typical engineered log jam projects was deemed not practical for this project. All of the proposed log jam sites are in inaccessible portions of the watershed. Creating new temporary roads to provide access to the proposed sites by heavy equipment needed to construct a typical engineered log jam, if it were even possible, would create substantial unwanted environmental impacts.

Initial project planning also considered the use of large, pre-made concrete structures, known as dolosse, to anchor the log jam structures. The use of dolosse was rejected because they would negatively and permanently impact aesthetics in the river corridors.

Alternatives Considered in Detail

This Environmental Assessment considers two alternatives: the Proposed Action and a No Action alternative. The No Action Alternative provides a basic description of current conditions against which the Proposed Action is compared. Because there were no unresolved conflicts, concerns, or relevant issues associated with the proposal, no other action alternatives were identified.

No Action

Under the No Action alternative no management actions included in the Proposed Action would be implemented. No construction of log jams or large wood structures would occur and no trees would be removed from the proposed wood source areas. Fish habitat conditions in the project reaches would remain in their current degraded condition. The ecological processes of fish habitat development and retention would continue to be disrupted by the lack of large wood and stable natural log jams.

Because this alternative would not accelerate restoration or recovery of aquatic habitat on National Forest System lands for ESA listed fish and other species in the Dungeness River, this alternative would not meet the Purpose and Need of the project.

Proposed Action

The proposed action is the installation of stable log jams within or adjacent to the active channel in the middle Dungeness and lower Gray Wolf Rivers (See Chapter 1; Figure 1-1) for location details). The log jams would be designed to simulate natural log jams and accelerate the recovery of channel processes, riparian conditions, and fish habitat. These

structures have been demonstrated to be effective in creating stable log jams, restoring riverine processes, and improving fish habitat in other large rivers (Roni et al. 2002; McHenry et al. 2007).

The four project reaches proposed for this project have the highest potential to help restore habitat-forming processes and improve fish habitat conditions on National Forest System lands in the middle Dungeness and lower Gray Wolf Rivers. Constructing a set of strategically placed log jams to simulate the natural log jams that were once common in the Dungeness Watershed is the most feasible approach for recreating the stable, functional log jams that are needed to create and maintain high quality fish habitat in these sections of the Dungeness and Gray Wolf Rivers.

The proposed log jams would occur within four selected reaches, two within the middle Dungeness and two within the lower Gray Wolf Rivers (see Chapter 1, Figure 1-1). The project area is entirely within National Forest ownership.

The proposed action includes:

1. Creation of heavy equipment access trails into and inside the proposed wood source units. Excavators would use trails to access wood source units. Access trails would be located mainly on old road grades and skid trails. No new road construction would occur. Access trails would be rehabilitated prior to completion of the restoration project and blocked using earth berms to prevent future vehicle use.
2. Removal of approximately 120 second-growth trees from wood source units to provide the woody material for the log jams. The trees would be trucked to staging areas on roads close to the proposed log jam sites.
3. Utilization of a helicopter to transport trees to the log jam project sites along the Dungeness and Gray Wolf Rivers and construct the log jams.
4. Construction of approximately 15 strategically placed log jams along the main river channels, and stabilization of three existing natural log jams (Figure 2-1).

Log Jams

The log jams are intended to scour pools and reactivate relic side-channels, and to serve as starting points for larger log jams that would form as mobile woody material is caught up against the structures. See Appendix A for design plans.

Each log jam would consist of approximately 8 (18-27 inches in diameter) trees and 4 bundles of slash (4-17 inches in diameter woody material). The majority of the trees would have attached rootwads. Because the log jams will be placed within a high energy river environment, a rock collar anchoring system would be incorporated into the design of the log jams for added stability. Rock collars, which act as ballast are made of large rocks connected by a short length of steel cable. Each log jam would have approximately nine rock collars. All materials would be placed using a helicopter.

Wood source

Approximately 120 second growth trees would be needed to provide the necessary large wood for the project. Trees ranging from 18 to 27 inches in diameter would be removed from a total of up to 2 acres of second-growth forest stands in the Adaptive Management Area (AMA) land allocation, within the Middle Dungeness River subwatershed. There are 6 potential wood source units within the Canyon Creek drainage, off FSR 2878, varying in size from 0.1 to 0.5 acre (see Figure 2-1). Most of the trees would be pushed over with an excavator and removed with their roots attached. Some of the trees would be felled by chainsaw. Tree removals would create a variety of small openings. All tree removals would be coordinated with wildlife and silviculture specialists to accomplish multiple objectives and minimize resource impacts (see following section for specific measures).

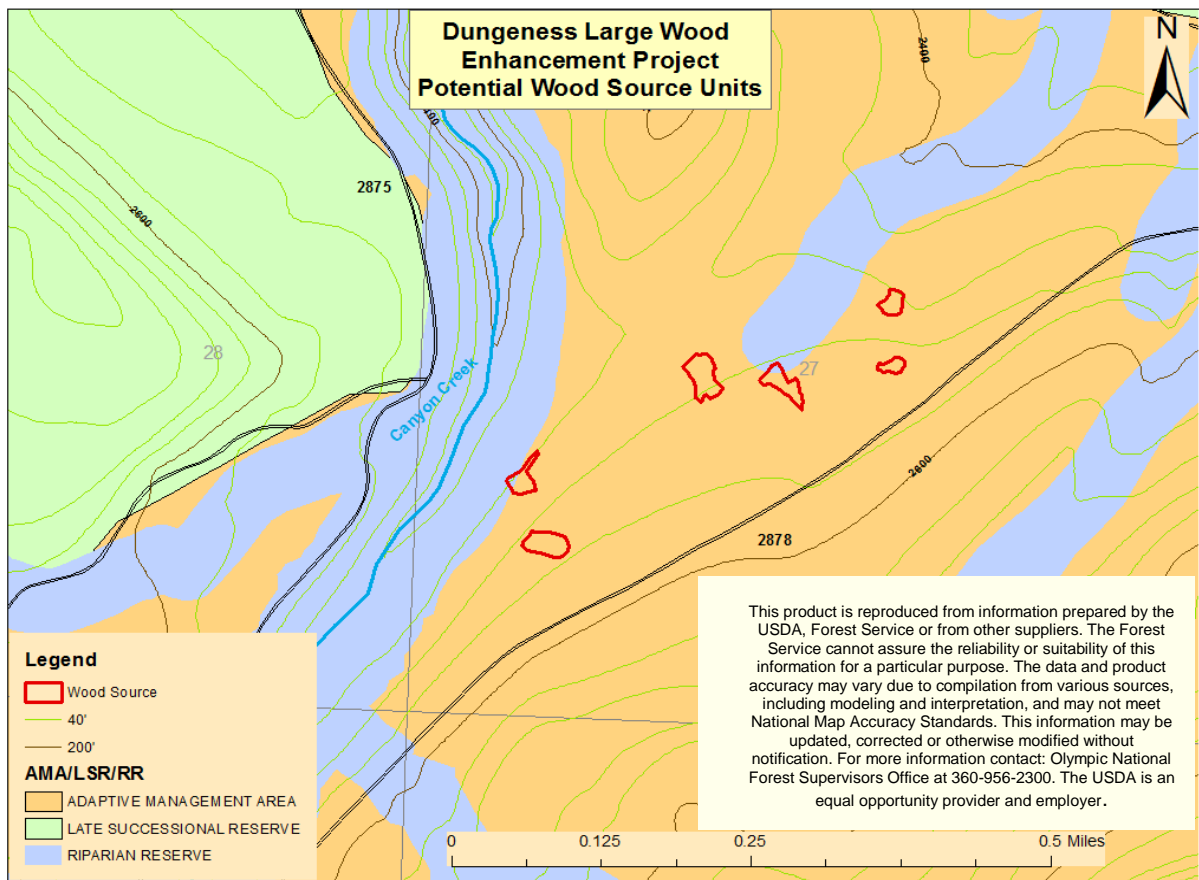


Figure 2-1. Dungeness Large Wood Enhancement Project Potential Wood Source Units.

Note: All units are within AMA, disregard minor mapping inaccuracies

Project Design Criteria, Mitigation Measures, and Monitoring

Project design criteria and mitigation measures are management requirements that would be imposed on the project for resource protection. They are presented here by resource area and/or project activity.

Wildlife

1. For activities generating noise (>92 db) within the harassment distance (Table Wildlife-1) of suitable marbled murrelet /spotted owl habitat, operate as late in the season as possible, preferably after July 15th. This pertains to the river sites and helicopter flight lines, but not the wood source units.
2. Employees and contractors will properly store and dispose of food and garbage while working on-site to avoid attracting corvids, to reduce indirect impacts to marbled murrelets and other wildlife.
3. Any woody material that is cut during clearing of the skid roads and that is not used for the log jam structures will be dispersed after operations to provide CWD cover on roads or units, or used in earth berms to prevent vehicle access.
4. Revegetate disturbed areas in tree removal units and skid roads by seeding with native seed mix where possible.
5. Helicopter pilots will report to the Forest Service any incidental sightings of bald eagles, great blue herons or other wildlife noted during the flights.
6. If active bald eagle nests are discovered, restrict chainsaw activities within 0.25 mile and helicopter activities within 1 mile of active bald eagle nests between Dec. 31 and Aug. 15.
7. If harlequin duck nests are found in the project area, restrict project activities within 50 m (164 feet) of active harlequin duck nests from April 1 through August 31.

Silviculture

1. Leave Tree Protection: Operations would be allowed to proceed during bark slippage as long as the following standards are met. To prevent scarring to residual trees a standard of at most 5% of stems exceeding 16 square inches of damage and 7% total stems damaged adjacent to created gaps would be in effect during all operations. Damage can be defined as loss of bark, exposing or breaking the cambium layer of the stem or roots. Damaged residual trees would not be removed, but left alive to potentially develop rot columns over time.
2. Snags and Coarse Woody Debris: All snags over 12 feet tall outside of the created gaps would be retained unless they pose a hazard to human safety. Where human safety is jeopardized, however, the snags could be felled, but must be left on-site as coarse woody debris. CWD existing on the site exceeding 30 inches in diameter could be moved for access, but would not be removed from the site, and disturbance would be minimized to

conserve CWD in the stands proposed for treatment. Equipment trails used for access would be blocked after operations to conserve CWD that might otherwise be removed for firewood. Big, old stumps would be kept intact and not uprooted wherever possible.

Invasive Plant Prevention and Management

1. Treat existing invasive plant infestations with appropriate herbicide, mechanical, or manual methods before ground disturbing activities begin when practical. If timing or resources prevent treatment before the project begins, then treat infestations in the project area upon completion of the project in order to prevent invasive plants from colonizing the disturbed ground.
2. Clean all off-road equipment of dirt/mud, seeds, and other plant parts before it is moved onto National Forest System lands. If operating in an area infested with invasive plants, clean all equipment before moving between sites or leaving the project area. For cleaning equipment on Forest Service land, the Contractor and Forest Service shall agree on methods of cleaning, locations of the cleaning, and control of off-site impacts, if any. 'Off-road equipment' includes all machinery other than log trucks, chip vans, pickup trucks or vehicles used to transport personnel on a daily basis.
3. All material (e.g. soil, gravel, sand borrow, aggregate, etc.) transported onto National Forest System land or incorporated into the work shall be weed-free.
4. Erosion control and weed prevention measures, such as seeding and mulching, will be implemented as necessary on disturbed soils as soon as possible after operations are complete. Mulch used on the project shall be weed-free. Seed used in the project shall be weed-free and meet state and local noxious weed laws.

Botany and Revegetation

1. Minimize damage or removal to red alder and big leaf maple 12 inch DBH or greater to mitigate impacts to local lichen and bryophyte diversity.

Aquatic Resources and Soils

The following PDCs are prescribed to avoid or minimize adverse impacts to soils and water quality, in compliance with the Clean Water Act and Washington State guidelines, and general Water Quality Best Management Practices (USDA Forest Service, 2012).

1. Boundaries of gaps and new equipment access trails (if necessary) will be flagged to delineate clearing limits associated with site access, skid trails, gap openings. This will minimize overall disturbance and disturbance to critical vegetation and sensitive areas.
2. Follow State Water Quality Guidelines – All project actions will follow applicable provisions of the Clean Water Act. A short-term exemption may be required from Washington Department of Ecology to exceed State water quality standards for turbidity (WAC 173-201A).
3. Erosion control measures, such as seeding and mulching, will be implemented on disturbed soils as soon as possible after operations are complete.

4. Equipment operations shall occur during the dry season (June through September) when soil moisture conditions are more suited for this activity in gap areas. If wet soil conditions exist at time of operations, equipment will be re-located to more suitable activity area, or be temporarily suspended until conditions improve.
5. Ground-based equipment will be limited to slopes less than 30 percent for ground-based (unless otherwise approved by the Forest Service).
6. Contractor will remove as much soil and rock material from tree root systems that are removed as possible. Soils in gap openings disturbed through tree removal will be re-contoured as much as possible to resemble pre-activity surface soil conditions. This will include filling of deeper holes and leveling of berms.
7. Retain as much slash and other coarse woody debris as possible in the gap openings. Tree tops left in the unit shall be bucked, lopped and evenly-distributed.

Activity Plans and Schedules

1. The contractor will develop a Schedule of Activities in coordination with the Contracting Officer.
2. The contractor will provide at least 48 hours advance notice prior to implementing sensitive activities.

Equipment Access Trails

1. New equipment access trails will be flagged and approved by the Forest Service prior to use.
2. Equipment trails or skid trails used for activities shall be restored to the pre-activity conditions to the extent possible. Any rutting or berms shall be repaired with deep ripping, and drainage structures installed to control surface runoff as needed.
3. Upon project completion the main equipment access trails for the wood removal units will be scarified to a minimum depth of 12 inches to mitigate any significant compaction and/or rutting created during project implementation.

Heavy Equipment

1. To prevent contamination, equipment shall be free of external petroleum-based products. Equipment shall be checked daily for leaks and any necessary repairs shall be completed prior to commencing work activities. All machinery fueling and maintenance involving petroleum products shall occur at a sufficient distance from stream channels, waterbodies, or wetlands to prevent delivery of potential contaminants. Spill containment equipment and material shall be on site and readily accessible.

In-stream Structures

1. All of the log jams will be designed and constructed to remain stable during at least 100-year flood events.

2. Work will comply with all provisions of the current (2012) MOU between the Forest Service and Washington Department of Fish and Wildlife (WDFW) regarding Hydraulic Projects if work is conducted by the Forest Service, or a separate Hydraulic Project Approval issued by WDFW if the work is implemented by a cooperator.
3. Work will comply with all provisions of the U.S. Army Corps of Engineers 404 permit and the associated Water Quality Certification prepared by the Washington Department of Ecology.

Cultural Resources

1. In the event that archaeological materials are encountered during project implementation work should be halted and the Forest Archaeologist should be contacted in order to assess the discovery and evaluate the significance.
2. In the event that skeletal material or features of burial/interment are encountered, all work must be stopped immediately and contact must be established with local law enforcement, the State Historical Preservation Office (SHPO), and the affected Indian Tribes.

Recreation and Public Safety

1. Hike-in access for kayakers and fishermen will be maintained at existing river access points.
2. The treatment reaches will be temporarily closed during construction and helicopter log transport.
3. Road closures will be implemented while logs are being transported overhead by helicopter.
4. The following design considerations will be incorporated into log jam placement to minimize potential safety risks to recreational kayakers:
 - All jams will be located within unconfined areas of the river along the river margins
 - No channel spanning jams will be constructed.
 - The jams will provide ample room to allow kayakers to safely navigate around them.
 - The jams will not be located below directly below blind corners to allow adequate sight distance for route planning.

Post-implementation Monitoring

Instream habitat and stream channel changes within the project areas will be monitored by establishing a series of photo points and by evaluating plan-form channel changes from periodic aerial photography. Periodic spawning surveys for steelhead and Chinook within the

project areas will be conducted to assess changes in the amount of spawning habitat present and fish utilization.

The constructed log jams will be inspected yearly to determine if the cable anchors are becoming loose and causing hazards for kayakers. If the hazardous cables are found in the log jams, the cables will be removed from the river.

As funding allows, stocking surveys will be performed in vegetation gaps in the second or third year following treatment to quantify natural regeneration, and if there are less than 150 TPA, artificial reforestation with an appropriate species mix may be used to obtain the desired stocking. Surveys of snags and CWD levels will be undertaken 3 to 5 years following implementation, to the extent possible given funding and resources, to ensure that objectives have been met and to assess the need for creation of additional snags or CWD within the stands.

The information gained through post-implementation monitoring will be used to inform the planning and design of future projects in the Dungeness River Watershed and throughout the Olympic National Forest.

CHAPTER 3 – ENVIRONMENTAL EFFECTS

Introduction

The proposed Dungeness Large Wood Enhancement Project is designed to recreate natural habitat-forming processes and improve fish habitat for Endangered Species Act (ESA)-listed fish species and other fish in the Dungeness and Gray Wolf Rivers. The project may also have effects on other resources and resource conditions, including other ESA-listed species and their habitats, Management Indicator Species (MIS), Sensitive Species of animals and plants, and invasive plant infestations. Additional resources that may be affected by the proposed action include Recreation, Visual Quality, Cultural Resources as well as others which will be discussed in this chapter. This chapter discusses and compares the environmental effects of the two alternatives described in Chapter 2 – the No Action Alternative and the Proposed Action.

40 CFR 1508 describes three types of effects that may result from an action: direct, indirect, and cumulative. Direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action and are later in time or farther removed in distance (40 CFR 1508.8). Cumulative effects are the impact on the environment which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the combined impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. The Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of past actions.”

Effects of past, present, and foreseeable future actions that may overlap in time and space with effects of the proposed action are relevant to the cumulative effects analysis for this project. Known past actions that still have present effects within the project area’s affected environment warrant consideration. Those actions are:

1. Timber harvest (Federal and non-Federal) and related activities, which resulted in the current deficit of large wood and associated degradation of fish habitat; and
2. Large wood removal from the river channel and cutting up of wood in the river channel in order to prevent impacts to roads and campgrounds (Federal and non-Federal lands).

Past actions are considered as part of the affected environment, unless otherwise noted in individual resource sections within Chapter 3.

Affected Environment

The affected environment for direct and indirect effects associated with the Dungeness Large Wood Enhancement Project consists of the four project reaches and their floodplains, nearby upstream and downstream areas, and the riparian areas through which project access would occur. Project activities and their effects would all be concentrated along the river channel in the vicinity of the four project reaches as well as at the AMA location where the trees will be supplied from to create the log jams. Fish habitat in the project area is currently in a degraded condition as a result of past activities in the watershed (see Background discussion and Current Condition section in Chapter 1 of this document).

In this chapter, the term “planning area” is used to refer to the portion of the Dungeness Watershed that includes National Forest System lands. The term “project area” is used to denote the portion of the planning area in which project activities would actually take place: the four proposed project reaches, the 6 wood removal units where logs may be supplied from and the area and surrounding habitat through which the project reaches would be accessed, including the area beneath the helicopter flight paths.

Fish and Fish Habitat

Introduction

This section begins with a discussion of the potential effects of the proposed action and the no-action alternative on fish and fish habitat. This assessment uses selected indicators from the “Matrix of Pathway and Indicators” taken from the 1996 NMFS document, *Making Endangered Species Act Determinations of Effects for Individual or Grouped Actions at the Watershed Scale* to analyze the different alternatives. Next is an assessment of the project’s potential effects to Endangered Species Act (ESA) Federally Listed fish species, and fish on the US Forest Service Region 6 Regional Forester’s Sensitive Species list. The section concludes with an assessment of the project’s relationship to Aquatic Conservation Strategy objectives, and federal Clean Water Act (CWA) compliance.

Fish Habitat

The primary objectives of the project are to improve and increase spawning and rearing habitat for not just ESA listed fish, but all fish species within the proposed log jam treatment reaches.

All proposed treatment reaches are within the Dungeness River watershed, and are within the Middle Dungeness River and Lower Gray Wolf River subwatersheds. Log jams would be constructed in four separate reaches of the Dungeness and Gray Wolf Rivers, between approximately river mile (RM) 13.4 and 14.2 on the Dungeness River and from RM 0.4 to 2.0 on the Gray Wolf River. Fish species found in these reaches are Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), pink salmon (*O. gorbuscha*), steelhead and resident rainbow trout (*O. mykiss*), sea-run and resident coastal cutthroat trout (*O. clarkii*), and sculpin (*Cottus* spp.). Table Fish-1 displays fish species found in the planning area and downstream of the planning area.

Table Fish-1. Fish species present in the Middle Dungeness and Lower Gray Wolf subwatersheds.	
Fish Species	Presence within the Middle Dungeness and Lower Gray Wolf Subwatersheds
Chinook salmon ^T	X
Coho salmon	X
Chum salmon summer ^T	O
Chum salmon fall	O
Pink salmon	X
Bull trout ^T	X
Steelhead ^T	X
Rainbow trout	X
Sea-run cutthroat	X
Cutthroat trout	X
Sculpin	X

T = Threatened ESA listed fish species

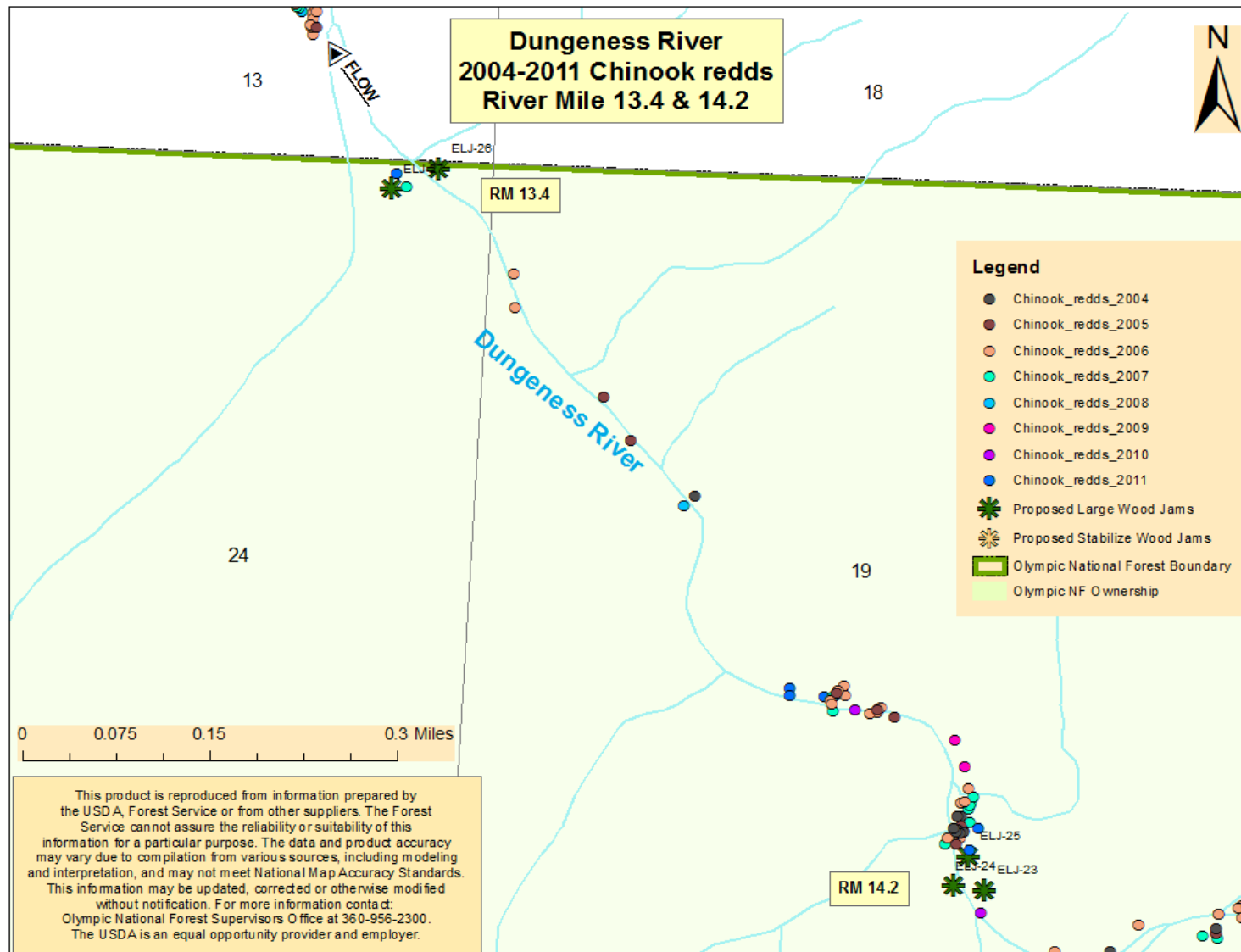
X = Found in planning area (may also be present downstream of planning area)

O = Found outside of planning area, lower in the subwatershed

There are six potential wood source units within the Canyon Creek drainage, off FSR 2878. All units are outside the Riparian Reserve and within the AMA, varying in size from 0.1 to 0.5 acres, totaling 1.8 acres, see map Figure 2-1 in Chapter 2. Wood source activities are planned to occur in the dry season and would not deliver sediment to Canyon Creek or affect riparian stands along Canyon Creek.

Figure Fish-1 and Figure Fish-2 show GPS locations of Chinook redds in the Dungeness and Gray Wolf Rivers, on National Forest lands from 2005 through 2011.

Figure Fish-1. Location of Chinook redds in the middle Dungeness River on NFS lands.



Selected indicators from the “Matrix of Pathway and Indicators” taken from the 1996 NMFS document, *Making Endangered Species Act Determinations of Effects for Individual or Grouped Actions at the Watershed Scale* were used to analyze the different alternatives. Indicators selected from the matrix are representative of habitat features that can be affected by a large woody debris project such as the one proposed. Indicators selected from the matrix are: temperature, sediment, large woody debris, pool frequency and quality, large pools, off-channel habitat, floodplain connectivity, and function of Riparian Reserve. The proposed alternatives were analyzed from these selected indicators to assess potential environmental effects based on existing conditions at the project scale. The ratings of these indicators show relative change to the baseline, and display if the action would have a beneficial, neutral or negative impact on the habitat indicator. Table Fish-2 contains the results of the assessment.

Table Fish-2. Selected indicators from the Matrix of Pathway and Indicators (NMFS 1996).					
	Baseline (Project scale) <i>(X = current condition of indicator)</i>			Effects of Proposed Alternatives (Project Scale)¹	
Indicator	Properly Functioning	At Risk	Not Properly Functioning	No Action	Proposed Action
Temperature	X			M	R
Sediment		X		M	d/R
Large Woody Debris		X		M	R
Pool Frequency and Quality		X		M	R
Large Pools		X		M	R
Off-Channel Habitat		X		M	R
Floodplain Connectivity		X		M	R
Riparian Reserve		X		M	M

R = Restore: project is likely to have a beneficial impact on habitat indicator.

M = Maintain: project may affect indicator, but impact is neutral.

D = Degrade: project is likely to have a negative impact on the habitat indicator.

d = Short-term negative impact, associated with project implementation phase.

Temperature

There are no 303d listed impaired stream segments for stream temperature in the Dungeness and Gray Wolf Rivers (Washington State Department of Ecology 2012).

Project effects on stream shade are used to assess the potential effects of the project's alternatives on stream temperature.

No Action Alternative

Direct, indirect, and cumulative effects

Under the no action alternative there would be no changes to current stream shade, and no impacts to stream temperature. Current conditions would be “maintained,” and stream temperatures would be expected to remain the same. Because there would be no action taken, there would be no cumulative effects with other past, present, or reasonably foreseeable actions.

Proposed Action Alternative

Direct, indirect, and cumulative effects

All of the wood source units for the project are outside the Riparian Reserve and would have no effect on riparian trees along Canyon Creek. During helicopter operations as trees are placed to create log jams in the Dungeness and Gray Wolf Rivers, rotor wash from the helicopter may break off some limbs of standing trees adjacent to the constructed log jams. This would represent a very minor change in the riparian canopy, and would have no measurable effect on the shade canopy to the river and no resulting effect on water temperatures. McHenry et al. (2007) have observed that engineered log jams can create cooler temperature microclimates in the deep scour pools created by the installed log complexes. Such decreases in water temperature would reduce salmonid stress in the summer months and improve habitat conditions for fish. The overall effects of the project actions on temperature are classified as “restore.”

The most relevant past actions influencing stream temperatures in the planning area are timber harvest in the floodplain, riparian, and valley bottom areas, and the removal of instream wood. There are no current or ongoing activities in the planning area that would be likely to affect stream temperatures. Given the anticipated effect of cooler aquatic microclimates in the scour pools created by the log jam structures, the cumulative effect of the proposed action on stream temperature would be either neutral (no change) or a slight improvement (cooling) of local stream temperatures.

Sediment and Substrate Embeddedness

The degree to which fine sediments surround coarse substrates on the surface of a streambed is referred to as embeddedness. Potential effects to this indicator include material displaced and sediment generated by trees being placed in the river.

No Action Alternative

Direct, indirect, and cumulative effects

The No Action alternative would have no impact on sediment input and substrate embeddedness, current conditions would be “maintained.” Lateral stream migration and bank erosion would continue to contribute to the sediment load of the Dungeness watershed. Because there would be no action taken, there would be no cumulative effects with other past, present, or reasonably foreseeable actions.

Proposed Action Alternative

Direct, indirect, and cumulative effects

Tree removal activities to provide wood for the log jams would occur outside Riparian Reserves and would be implemented during the summer dry season. No sediment delivery to Canyon Creek would occur.

Helicopter placement of trees in the river channel has the potential to generate sediment and turbidity as the log jams are constructed. Potential impacts would be minor. Any increases in sediment or turbidity would be very limited in both duration and extent. Impacts would be limited to the immediate project area during the time when logs are actually being placed or moved within the wetted stream channels. Short term increases in turbidity and sedimentation within the immediate construction area during the implementation phase could result in a short term negative effect to fish and fish habitat. Increased turbidity generated during log placement activities could temporarily displace fish. The increased levels of fine sediment and turbidity within the project area would be short in duration and far below levels lethal to fish. The increases in suspended sediments would be below levels that are documented to have a negative effect on salmonid rearing habitat (Newcombe and Jensen 1996). Rotor wash from the helicopter is expected to cause fish to move out of the immediate construction sites as logs are placed by the helicopter in the river. The impact to the overall populations would be very small and limited.

Chinook salmon, coho salmon, and bull trout are all fall-spawning fish that spawn within the project reaches. Pink salmon also utilize spawning habitat within the project area in odd years. Fine sediments mobilized as a result of log placement activities could be deposited in spawning areas, but impacts to spawning and egg survival would be negligible due to the minimal amount and extent of sediment produced by placing woody material into stream channels with a helicopter. Fine sediments mobilized and deposited as a result of log placement activities are likely to be remobilized during the next high flow and redistributed downstream, where they would quickly become indistinguishable from the natural sediment carried by the river channel. Fine sediment deposited within the project areas due to construction activities would be undetectable within spawning areas the following spring.

Stream channel changes and changes in scour and deposition as the stream adjusts to the new log jam structures have the potential to create short term negative impacts to redds and egg survival for fish that spawn within the project area before the first large storm events in the fall and winter of 2016. Impacts would be localized in the immediate vicinity of the new structures. The streambed would be expected to respond rapidly to the new structures and recreate a new, stable channel configuration within the first several large storm events.

Overall, the short term direct and indirect effects of the project actions on sediment, turbidity, and substrate embeddedness are expected to move the baseline condition toward a “degrade” rating for a short period (approximately one week during the construction phase). Short term adverse effects would be localized within the immediate project areas. The log jam structures would be designed to trap and retain mobile gravel substrate and sediment within the project reaches. Studies have shown that large wood complexes not only catch bedload, but the size of gravel that is retained increases spawning habitat for salmonids (McHenry et al. 2007). In the long term, the large wood structures would both increase the amount of spawning habitat and stabilize it so spawning gravels are retained over time. Therefore, the long term direct and indirect effects of the project on these indicators are considered “restore.”

Relevant past actions influencing stream sediments and turbidity in the planning area are timber harvest and road-building, both of which resulted in increased sediment loads to the river. Removal of instream wood altered the river’s sediment sorting and storing capacities. These processes are recovering slowly, but the recovery is hindered by the lack of stable log jams. There are no known current or foreseeable actions that would substantially affect sedimentation and substrate embeddedness. The cumulative effect of the proposed action with past effects on this indicator would be a localized improvement in the river’s ability to sort and store sediment.

Large Wood

Large wood (LW) is a fundamental element of the process of fish habitat creation and maintenance. Some of the key functions of large wood include deflecting flow, dissipating energy, creating local scour pools, sorting and storing sediment, increasing local water surface elevation, and providing in-stream cover; all of which increase in-stream channel and habitat complexity.

Due to past land management practices, there is a shortage of large key pieces of wood in the middle Dungeness River and lower Gray Wolf River that are capable of anchoring stable log jams. Natural pieces of instream wood in the middle Dungeness and lower Gray Wolf tend to be relatively small and mobile which are transported downstream during high flows. Some of the wood pieces are eventually carried down to the lower Dungeness River. Other pieces lodge in various places within the river channel or are incorporated into relatively short-lived log jams within the channel or on the floodplain. Studies have shown that the stability of natural log jams is linked to the presence of one or more immobile snags or key members (Keller and Swanson 1979). Unless log jams are anchored by large, key pieces, they tend to be predominately short-term, transient features. The general trend of relatively small wood pieces racking up into transient log jams that disappear or shift positions frequently has been consistent within the watershed for at least the past decade.

A 2010 USFS habitat survey of the Dungeness River (Reach 1 from RM 13.4 to RM 16.0) and the Gray Wolf River (Reach 1 from RM 0 to RM 2.0) counted a total of 127 pieces of wood, and 125 pieces of wood in the respective reaches, see Table Fish-3. Proposed treatment locations on the Dungeness are at approximately RM 13.4 and 14.2; and on the Gray Wolf from RM 0.4 to 0.8, and from RM 1.8 to 2.0. Although there is a moderate amount of wood in the river channels, the majority of the instream wood is categorized as “Small” and “Medium” and make up 99% to 100% of all wood found within the surveyed reaches. These are the wood pieces that are relatively mobile and typically form the bulk of the existing log complexes and transient log jams. No large pieces of wood were observed in the entire 2.6 mile reach of the Dungeness, and only one large piece of wood in the 2.0 mile reach of the Gray Wolf (USDA Forest Service 2010). Large pieces, which are at least 36 inches in diameter and at least 50 feet in length, are the size of trees that are generally needed to be relatively immobile and create stable foundations for natural log jams in rivers as large as the Dungeness and Gray Wolf.

Table Fish-3. Wood count per reach in Dungeness and Gray Wolf Rivers (USDA Forest Service 2010).

River	Survey Reach No.	River Mile	Wood Pieces per Mile					
			Small ¹	Medium ²	Large ³	Total	Total pieces of wood in reach	Large pieces (key pieces)/100 meters
Dungeness	1	13.4-16.0	47.3 (97%)	1.5 (3%)	0	48.9	127	0
Gray Wolf	1	0-2.0	61.6 (94%)	3.8 (5%)	0.5 (1%)	65.9	125	0.03

¹Small piece = >12 in. in diameter at 25 ft. from large end; >25 ft. or 2x the bankfull width

²Medium piece = >24 in. in diameter at 50 ft. from large end; >50 ft. or 2x the bankfull width

³Large piece = >36 in. in diameter at 50 ft. from large end; >50 ft. or 2x bankfull width (10.13 m³)

Fox et al. (2003) developed reference conditions for instream wood in western Washington Rivers, see Fish-4. A qualifying key piece for a river with a bankfull width between 20-30 meters is defined to be at least 9.75 cubic meters. Average bankfull width for the Dungeness Reach 1 is 27.8 meters, and the average bankfull width for the Gray Wolf Reach 1 is 20.1 meters.

Table Fish-4. Number of pieces per 100 meters of channel length (Fox et al. 2003).				
Large wood count /100m	Bankfull Width class (m)	Good	Fair	Poor
Key pieces	>10-100	>4	1-4	<1

Based on the Fox et al. data, a “Good” rating for large key pieces of wood per mile in a river the size of the Dungeness or Gray Wolf would be greater than 64 large key pieces per mile. The 2010 FS survey data shows a severe lack of large wood pieces within the proposed treatment reaches in the Dungeness and Gray Wolf Rivers, especially large key pieces that are the basis for stable log jams.

No Action Alternative

Direct, indirect, and cumulative effects

The no action alternative would have no impact on the number, size, or stability of in-stream wood pieces or large wood complexes. Current low levels of instream wood pieces large enough to form stable log jams would be “maintained” at the current “At Risk” level for the foreseeable future. The lack of large key pieces of instream wood within the middle Dungeness and lower Gray Wolf Rivers would continue to inhibit the formation of juvenile salmonid rearing habitat, suitable spawning sites, and habitat diversity. The existing riparian trees would eventually grow large enough to form key pieces and begin to be recruited into the stream channel in large enough numbers to begin to form stable log jams, but the trees would need to be very large (i.e 36 inch DBH) to be effective. There would be no action taken, so there would be no cumulative effects with other past, present, or reasonably foreseeable actions.

Past in river wood removal has reduced the amount of large wood available for the formation of stable log jams. The No Action alternative would not alter the cumulative effects of past activities that have altered instream wood availability and dynamics. The lack of stable log jams within the Dungeness and lower Gray Wolf Rivers would persist for the foreseeable future until riparian trees grow large enough so that the combination of tree height, diameter of the root wad, and mass of the trees counteract the ability of the river to transport the wood and enough of the trees are recruited into the river to form stable key pieces to anchor ensuing log jams.

Proposed Action Alternative

Direct, indirect, and cumulative effects

The construction of 15 log jams at selected locations within the stream channel would directly and indirectly increase the amount, size, and stability of instream wood within the treatment reaches. Re-establishing the appropriate habitat-forming processes related to stable instream wood would, in turn, increase hiding cover, floodplain connectivity, pool quality

and quantity, and nutrient retention. Therefore, the effect of this alternative on this indicator is classified as “restore.”

The addition of stable large wood structures would noticeably increase channel complexity. Benefits to adult and juvenile salmonids from the additions of LW include the addition of cover, increased pool depths, and retention of carcasses and other organic materials. The marine-derived nutrients associated with salmon carcass decomposition are known to play a major role in the productivity of aquatic and riparian systems within watersheds with anadromous fish in the Pacific Northwest (Cederholm et al. 2000). The creation of stable large wood structures and the increased retention of these nutrients would indirectly benefit all ecosystem components, ranging from stream micro-organisms and benthic macro-invertebrates, to top level predators such as eagles and bears.

In the long term, salmonids would benefit from a restored and self-maintaining level of channel complexity. The stable large wood structures would also provide roughness elements that would help regulate bed-load movement of the river channel and fine sediment deposition on the floodplain through time.

Relevant past actions that influenced this indicator are large-scale timber harvest within the managed portions of the watershed— especially in the river valley, riparian areas, and floodplain – and the removal of instream large wood to protect roads and campgrounds. These activities no longer occur on federal lands in the watershed, although timber harvest and floodplain development may continue to take place on non-federal lands. The completion of an engineered log jam (ELJ) project, on the lower Dungeness River, in the vicinity of Rail Road Park Bridge has increased large wood volume in the lower watershed. By installing log jams at strategic points in the river channel and restoring some of the river’s natural large wood dynamics, the Dungeness Large Wood Enhancement project would have a positive cumulative effect. The project would have no direct, indirect, or cumulative effect on the natural availability of large wood in the watershed.

Pool Frequency, Quality, and Large Pools

Pools generally form at the downstream end of instream structures or obstructions such as falls, very large boulders, and stable log jams. These pools provide important components of fish habitat, such as hiding cover, foraging opportunities, resting areas, and areas of cooler water. The 2010 habitat survey data shows low pool frequency and low percent of deep pools, see Tables Fish-5 and Fish-6.

Table Fish-5. Habitat area by reach in the Dungeness and Gray Wolf Rivers (USDA Forest Service 2010).

River	Survey Reach No.	River Mile	% Fast-water Area	% Pool Area	% Side Channel Area
Dungeness	1	13.4-16.0	77.8	19.3	2.9
Gray Wolf	1	0-2.0	78.4	17.2	4.4

Table Fish-6. Pool habitat summary in the Dungeness and Gray Wolf Rivers (USDA Forest Service 2010).

River	Survey Reach No.	River Mile	Number of Pools	Average Residual Pool Depth	Pool Area (%)	Pools/ Mile	Pools w/ >3 ft. Depth per Mile
Dungeness	1	13.4-16.0	19	4.3	19.3	7.3	7.3
Gray Wolf	1	0-2.0	18	2.6	17.2	8.5	8.1

No Action Alternative

Direct, indirect, and cumulative effects

The no action alternative would have no impact on pool frequency, quality, and large pools. Current conditions would be “maintained” at the current “At Risk” level for the foreseeable future. Pool frequency, quality, and large pools would be expected to slowly improve in the very long term (50 to 100 years or more), as existing riparian trees grow and eventually fall into the river. No action would be taken that could result in cumulative effects with other past, present, or reasonably foreseeable actions.

Proposed Action Alternative

Direct, indirect, and cumulative effects

The log jams are designed to create scour pools and decrease channel width-to-depth ratios. Additional pools would be created by these structures, and existing pools would be enhanced. Monitoring in the “Mining Reach” of the Wind River on the Gifford Pinchot National Forest documented increases in bank-full pool volume within a half-mile reach of up to 520 percent after installation of log jams (USDA 2000).

The increase in large pools would directly and indirectly benefit all species and life stages of fish by providing resting habitat with low water velocity, bubble curtains, and depths that provide hiding cover from predators. In addition, the increase in large pool habitat would indirectly increase foraging efficiency for juvenile and resident life stages of fish. All these improvements to pool characteristics relate to improved rearing habitat for all fish species in the Dungeness and Gray Wolf Rivers. The direct and indirect effects of the proposed action on these indicators are classified as “restore.”

Past actions relevant to this indicator are the removal of large in-stream wood, and timber harvest that reduced the source for future large wood. No current, ongoing, or foreseeable

future actions on federal lands would influence this indicator. It is unlikely that this indicator would be affected by actions on non-federal lands unless those actions directly affected existing instream structures or resulted in new ones, like large wood jams. The cumulative effect of the proposed action on this indicator would be overall improvement.

Off-Channel Habitat

Off-channel habitat is important to salmonids residing in the river over winter because it provides refuge from seasonal high flows. Currently off-channel habitat is limited in the planning area because the glacial nature of the river valley in general provides few low-gradient tributaries for overwintering. 2010 habitat surveys show the low percent of side channel area, see Table Fish-5, above.

No Action Alternative

Direct, indirect, and cumulative effects

The no action alternative would have no impact on this indicator, current conditions would be “maintained.” The limited amount of side-channel habitat would persist within the anadromous reaches of the Dungeness and Gray Wolf Rivers. Because there would be no action taken, there would be no cumulative effects with other past, present, or reasonably foreseeable actions.

Proposed Action Alternative

Direct, indirect, and cumulative effects

The proposed treatment areas include low gradient and unconfined reaches of the river on National Forests lands. The constructed log jams would increase off-channel habitat by reactivating old side-channels. This would increase rearing habitat for all fish in all treatment reaches, thus improving conditions and contributing a restorative effect to this indicator.

Floodplain Connectivity

Floodplain connectivity is important to fish habitat because floodplains and their many flow paths provide a source of nutrients and, where it’s available, large wood to the main channel. Floodplains also serve to slow the velocity of high flows, allowing fine sediment to settle. Given that there is less large wood in the river and tributaries now than there was historically, there was probably more frequent interaction between the river and its floodplains in the past than there is today. The proposed treatment reaches, despite being in unconfined alluvial reaches of the river, have incised channels and are over-steepened given the width of the valley and abundance of sediment available to the system.

No Action Alternative

Direct, indirect, and cumulative effects

The no action alternative would have no impact on floodplain connectivity, current conditions would be “maintained.” Low gradient and unconfined reaches of the river in the

planning area would continue to be disconnected from their floodplains. No action would be taken, so there would be no cumulative effects with other past, present, or reasonably foreseeable actions.

Proposed Action Alternative

Direct, indirect, and cumulative effects

Large wood provides channel roughness and encourages the river to migrate into multiple flow paths across the floodplain. By increasing channel roughness, the proposed log jams would serve to increase interactions between the main channels and the surrounding floodplains. The intent is to encourage the river to migrate into multiple flow paths across the floodplain. Therefore, the long term direct and indirect effects of the project on this indicator is considered “restore.” The proposed action would not affect floodplain connectivity downstream of the planning area.

Relevant past actions that have had lasting effects on floodplain connectivity in the planning area and the watershed as a whole include road construction, which in places constricts the river; the active removal of instream large wood; and timber harvest, which resulted in a shortage of available large wood to replace what has been lost. There are no foreseeable future actions on federal lands in the planning area that would measurably impact floodplain connectivity. The project would reconnect the river with its floodplain in the majority of unconfined low gradient reaches on National Forest System lands in the watershed. The cumulative impact of the proposed action would have an increase in overall floodplain connectivity in the watershed.

Riparian Reserves

Riparian Reserves were established by the Northwest Forest Plan (NWFP). Riparian Reserves for fish-bearing streams are defined as 300 feet or a distance equivalent to two site-potential tree heights, whichever is farther, until site-specific analysis justifies a reason to change that distance. This designation does not preclude management activity in the riparian area. The objective of management within Riparian Reserves is to attain consistency with the Aquatic Conservation Strategy (ACS) of the NWFP. ACS Objectives are discussed below in the Aquatic Conservation Strategy Consistency section.

The 2010 Forest Service habitat survey of the Dungeness and Gray Wolf Rivers evaluated riparian condition. Riparian conditions along the proposed treatment reach in the Dungeness appear to be relatively good. Size class of the riparian vegetation within 100 feet of the river was categorized as large tree, trees 21-31.9 inch diameter at breast height (DBH). The largest size class, in the Forest Service habitat protocol is mature tree, trees greater than 32 inches DBH. The dominant overstory tree species was Douglas fir, which would rate the recruitment potential - the ability of the riparian area to supply trees that will fall into the river – as good. Riparian condition in the lower Gray Wolf was not as good as the middle Dungeness. Size class for the riparian area along the lower Gray Wolf was observed as small tree, trees 9.0 to 20.9 inches DBH; and the dominant overstory riparian species was red alder (75%), see Table Fish-7 below. Alder trees decompose relatively quickly compared to

conifer trees in rivers, thus alders are not generally suitable to serve key pieces in long-term stable log jams.

Riparian areas on National Forest System lands along the lower Gray Wolf River project area are slowly recovering as trees grow and some of the hardwood dominated stands convert back to conifers. However, the majority of the existing riparian stands in the lower Gray Wolf are young, small-diameter trees or hardwoods that, even if recruited into the river, are not large enough to form stable log jams in a river the size of the Gray Wolf or Dungeness. Recovery of natural sources and quantities of instream large wood in the lower Gray Wolf will take decades for enough trees to grow large enough and then to fall over and be recruited into the stream channel.

Table Fish-7. Riparian tree size class and composition along Dungeness and Gray Wolf Rivers (USDA Forest Service 2010).					
River	Survey Reach No.	River Mile	Size Class	Overstory	Understory
Dungeness	1	13.4-16.0	ST=20%, LT=80%	CD=100%	CH=40% CC=40% HA=20%
Gray Wolf	1	0-2.0	ST=100%	CD=25% HA=75%	CD=50% CH=25% HA=25%

Size class: LT= Large Tree (21-31.9 inch DBH), ST= Small Tree (9-20.9 inch DBH)

Overstory Species: CD= Douglas fir, CH= western hemlock, CC= western red cedar, HA= red alder.

No Action Alternative

Direct, indirect, and cumulative effects

The no action alternative would have no impact on riparian conditions – current conditions would be “maintained.” The riparian forests would continue to grow at current rates, with steady improvement in forest structure and diversity as trees became more mature and increased self-thinning occurred. Over the long-term (50-100+ years), root networks would help stabilize soils, canopy cover would more sufficiently shade streams, and sources of large wood recruitment would continue.

Proposed Action Alternative

Direct, indirect, and cumulative effects

All proposed wood source units associated with the project are outside Riparian Reserves, and tree removal activities are scheduled to occur during the dry season. No impacts to Riparian Reserves are expected from the tree removal activities to provide wood for the log jam construction.

During the construction phase some trees along the riverbank may have limb damage from the rotor wash as trees are placed in the river channel by the helicopter. Disturbance to the standing tree riparian trees would be minor and not affect the long term health of the riparian trees. The overall effects of the proposed action on the Riparian Reserved would be neutral and current conditions would be classified as “maintained”.

Working in reaches of the watershed that have a relatively intact healthy riparian condition is an added benefit to fish habitat. The project couples the short-term benefit of wood placement to create high-quality fish habitat, with riparian areas that are on healthy trajectories that supply natural sources of wood, which result in a sustained long-term benefit to the habitat forming processes in the middle Dungeness and lower Gray Wolf.

ESA Federally Listed Threatened Fish and Essential Fish Habitat

Puget Sound Chinook, Puget Sound steelhead, and Hood Canal summer chum have been listed as threatened by the National Marine Fisheries Service (NMFS). Both Puget Sound Chinook and Puget Sound steelhead occur within the planning area. NMFS has designated Critical Habitat for Puget Sound Chinook, which includes the Dungeness River up into the Olympic National Park. NMFS has proposed critical habitat for Puget Sound steelhead that, if approved, would include proposed treatment reaches within the planning area. Hood Canal summer chum are lower in the watershed off National Forest Land (Washington Department of Fish and Wildlife and Point-No-Point Treaty Tribes 2000), and its designated Critical Habitat is also downstream from the planning area. Coastal Puget Sound bull trout have also been listed as threatened by the US Fish and Wildlife Service (USFWS), and are present in the planning area. USFWS has also designated Critical Habitat for bull trout within the planning area.

Essential Fish Habitat (EFH) has been designated by NMFS within the Dungeness watershed under the Magnuson-Stevens Fishery Conservation and Management Act (NMFS 2004). EFH includes all Chinook, coho, and pink salmon habitat. EFH in the Dungeness River extends from the river mouth upstream to the anadromous barrier falls at approximately RM 19.7; and up to RM 8.7 on the Gray Wolf River.

No Action Alternative

Direct, indirect, and cumulative effects

The No Action alternative would leave the proposed project area stream channel conditions in their current state. Altered channel habitat-forming processes and the resultant degraded channel conditions and degraded fish habitat would continue for the foreseeable future until

the existing riparian trees grow large enough and enough of the large trees are recruited into the river to begin to create stable natural log jams. The No Action alternative would have no direct or indirect effect on ESA listed threatened fish, designated Critical Habitat, or Essential Fish Habitat. Because there would be no management action, there would be no cumulative effects with past, current, or foreseeable future actions.

Proposed Action Alternative

Direct, indirect, and cumulative effects

The ESA effects determinations for the proposed action for Puget Sound Chinook, Puget Sound steelhead, and Coastal Puget Sound bull trout are “*Not Likely to Adversely Affect*” due to short-term disturbance, sedimentation, and turbidity related to in-stream activities and potential short-term impacts to current spawning habitat. Over the long-term, the project would improve habitat conditions and promote recovery for all species. The ESA effects determinations for Hood Canal summer chum is “*No Effect*”, due to the absence of summer chum within the planning area. Effects determinations for designated Critical Habitat for Puget Sound Chinook, Coastal Puget Sound bull trout, and for proposed Critical Habitat for Puget Sound steelhead are “*Not Likely to Adversely Affect*.” Table Fish-8 shows the effects determinations for federally listed fish for both the No Action alternative and the Proposed Action.

Table Fish-8. Federally Listed Threatened Fish Determinations		
Species and critical habitat	No Action	Proposed Action
Puget Sound (PS) Chinook	“No Effect”	“Not Likely to Adversely Affect”
Puget Sound (PS) steelhead	“No Effect”	“Not Likely to Adversely Affect”
Critical Habitat for PS Chinook	“No Effect”	“Not Likely to Adversely Affect”
Proposed Critical Habitat for PS steelhead	“No Effect”	“Not Likely to Adversely Affect”
Hood Canal (HC) summer chum	“No Effect”	“No Effect”
Critical Habitat for HC summer chum	“No Effect”	“No Effect”
Coastal Puget Sound (CPS) bull trout	“No Effect”	“Not Likely to Adversely Affect”
Critical Habitat for CPS bull trout	“No Effect”	“Not Likely to Adversely Affect”

Chinook redds have been documented in several of the project areas. Figures Fish-1 and Fish-2 display the locations of Chinook redds from 2005 to 2011 in relationship to the proposed project areas.

Placement of the proposed large wood structures would likely disturb or alter some potential spawning sites that have been used for spawning in recent years; however, the overall impact of the project would be to improve the quality and quantity of spawning habitat for Chinook, steelhead, and bull trout and better maintain the longevity of the spawning areas over time. Stable instream large wood are very effective at trapping and sorting gravel substrates moving through stream channel to create high quality spawning habitat (McHenry et al. 2007). In most of the proposed treatment reaches in the lower Gray Wolf River redds have not been observed in them since 2007. In high energy reaches with limited structure and relatively coarse substrates the proposed log jam structures would trap gravels and increase the amount of potential spawning habitat available. In project areas that already have good quality spawning habitat that has been used for spawning in recent years, such as the reaches in the Dungeness Reaches, the log jam structures would be designed to reinforce and provide long-term stability to the relatively small and mobile wood structures that create the present spawning areas. Without large key pieces to provide some stability during floods, it is likely that the small wood complexes and log jams that currently trap gravels in these areas will fall apart and be washed away and what are currently good spawning habitats will be lost.

Short-term sediment impacts and potential short-term impacts to some current spawning habitat would adversely affect Essential Fish Habitat (EFH) during the construction phase of the project. However, re-establishing the appropriate habitat-forming processes associated with stable accumulations of large wood within the middle Dungeness and lower Gray Wolf would provide long-term benefits and would result in an improvement over current conditions.

Consultation for the effects of the proposed project, including removal of trees at the source stand and installing the large wood structures in the river, is an action covered by the U.S. Fish and Wildlife Service and National Marine Fisheries Service programmatic Biological Opinions for Aquatic Habitat Restoration Activities in the States of Oregon and Washington (USDI 2013, USDC 2013).

US Forest Service Region 6 Regional Forester's Sensitive Fish Species

This environmental assessment uses the 2015 US Forest Service Region 6 Regional Forester's Sensitive Species List. There are no fish species on the Forest Service Region 6 (R6) Sensitive Species List that occur within the planning area.

No Action Alternative

Direct, Indirect and Cumulative Effects

The No Action alternative would leave the proposed project area stream channel conditions in their current state. Altered channel habitat-forming processes and the resultant degraded channel conditions and degraded fish habitat would continue for the foreseeable future until the existing riparian trees grow large enough and enough of the large trees are recruited into the river to become stable natural log jams. The effects determinations for all of these species under the No Action alternative would be “no effect.”

Because there would be no project activities, the project would have no direct or indirect effects that could contribute to or offset the cumulative effects of past, present, or reasonably foreseeable actions.

Proposed Action Alternative

Direct, Indirect and Cumulative Effects

Table Fish-9 displays the effects determinations for the Proposed Action.

Table Fish-9. Region 6 Sensitive Fish Species and Effects Determinations.				
Fish Species	Proposed Action			
	<i>No Effect</i>	<i>May Impact Individuals Or Habitat, But Will Not Likely Contribute To A Trend Towards Federal Listing Or Cause A Loss Of Viability To the Population or Species</i>	<i>Will Impact Individuals Or Habitat With A Consequence That The Action Will Contribute To A Trend Towards Federal Listing or Cause A Loss Of Viability To The Population Or Species</i>	<i>Beneficial Impact</i>
Olympic Mudminnow	X			

The project would have “no effect” on Olympic mudminnow because this species is not found in the Dungeness watershed (Mongillo and Hallock 1997).

Past actions relevant to R6 Sensitive fish species are intensive timber harvest, the removal of instream wood, and road construction. All of these activities have negatively impacted fish habitat. Use and maintenance of the Forest Service road system continues to contribute some chronic sedimentation to fish habitat in the planning area. There are no foreseeable activities on Federal lands that would notably affect fish habitat in the watershed. Roads, timber harvest, and other development on private lands are likely to continue into the foreseeable future. The Proposed Action includes no activities whose effects would add to the negative cumulative effects of past, present, or foreseeable actions. The effects of the Proposed Action may, to a small degree, offset some of the negative impacts to fish habitat that have accumulated from the effects of past actions.

Aquatic Conservation Strategy Consistency

The Aquatic Conservation Strategy (ACS) is a component of the Northwest Forest Plan. The ACS was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands (USDA Forest Service and USDI Bureau of Land Management 1994b). This section compares the effects of the Proposed Action with the Aquatic Conservation Strategy Objectives described in the NWFP. Additional information supporting the “maintains” or “restores” determinations can be found in the

effects analyses contained in the different resource area sections within this chapter of this environmental assessment.

ACS Objective 1. *Maintain and restore the distribution, diversity, and complexity of watershed- and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.*

This project would contribute to a restorative effect on Objective 1 by reestablishing the aquatic habitat creating functions associated with large in-stream wood structures.

ACS Objective 2. *Maintain and restore spatial and temporal complexity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.*

The Proposed Action would help to restore spatial complexity within the Dungeness River watershed by the strategic placement of stable instream large wood structures in structurally simplified stream reaches. These features are designed to increase aquatic habitat complexity by causing the formation of pools, gravel deposits, and other important elements of fish habitat. They would also restore temporal complexity by encouraging the river to flow into side channels and floodplains during periods of high flow, providing over-wintering habitat for salmonids and resident fish. Access to currently isolated side channels and more frequent access to floodplains would benefit young salmonids by allowing them relief from the high velocities associated with incised, simplified stream channels.

ACS Objective 3. *Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.*

This project would have a restorative effect on Objective 3 by reestablishing physical structures important to the aquatic system – stable log jams – that are currently underrepresented. The large wood jams would stabilize banks in the project reaches, and help to address the over-steepened channels and unnaturally incised streambeds in the project reaches.

ACS Objective 4. *Maintain and restore water quality necessary to support healthy riparian, aquatics, and wetland ecosystems. Water quality must remain with the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.*

The Proposed Action would result in limited, short-term negative impacts to local water quality as a result of sediment and turbidity associated with log jam construction. The Dungeness and Gray Wolf Rivers are glacial rivers with naturally high sediment loads. The sediment generated from this project, would be well within the historic range of natural variability for the river. In the long term the project would have a restorative effect on water quality. The scour pools that form at the downstream ends of the log jams would provide areas of deep, cooler water important for salmonids.

ACS Objective 5. *Maintain and restore the sediment regime under which aquatic systems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.*

This project would contribute to the restoration of a more natural sediment regime within and downstream of the project reaches. The log jams would provide channel roughness, help dissipate stream energy, and promote a more natural gravel sorting, routing and storage of sediment. Over time, as the log jams function to catch and retain more instream wood, more frequent interactions between the main channel, side channels, and the floodplains would further restore more of the natural sediment regime.

ACS Objective 6. *Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.*

The Proposed Action would maintain instream flows at their current conditions. There are no man-made dams or other flow-control devices associated with this project. The current timing, magnitude, duration, and distribution of in-stream flows would not be affected by the proposed log jams.

ACS Objective 7. *Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.*

This project would contribute a restorative effect to ACS Objective 7. The log jams would help to reestablish floodplain connectivity by encouraging more frequent interaction between the main channel, side channels, and floodplains. Over time, this effect would increase as additional wood is captured by the log jams, and as the log jams function to restore a more natural sediment regime and reverse the negative influence of the incised stream channel on the floodplain.

ACS Objective 8. *Maintain and restore the species composition and structural diversity of plant community in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate surface erosion, bank erosion, and channel migration and to supply amounts and distribution of coarse woody debris sufficient to sustain physical complexity and stability.*

The Dungeness Large Wood Enhancement project would have a restorative influence on riparian areas. All wood source units are outside the Riparian Reserves. Native plant communities are expected to recover quickly on all areas disturbed by project activities. The log jams themselves would stabilize streambanks and streamside vegetation. Nutrient filtering would improve as the incised streambeds recover and floodplains are more frequently inundated, and floodplain vegetation, including wetlands, would also benefit. The log jams are designed to capture and release coarse woody debris over time as stream flows vary, and would restore a more natural large wood dynamic to the watershed.

ACS Objective 9. *Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.*

The installation of log jams in the project reaches as described in the Proposed Action would restore aquatic habitat complexity and improve riverine processes that have been degraded as a result of a lack of stable instream large wood structures. There would be temporary, short-term negative effects associated with log jam construction; however, the long-term effects of the project would be of considerable benefit to riparian-dependent native plant and animal species. Improved instream habitat complexity would restore a wider range of habitat types for aquatic species, including fish and invertebrates. This would also benefit native predators, including eagles and bears. Increased bank stability and floodplain connectivity would improve conditions for wetland and floodplain vegetation.

Clean Water Act Compliance

Section 303d of the Clean Water Act mandates that Total Maximum Daily Loads (TMDLs) be developed to address the factors causing the impairment of beneficial use for all 303(d) listed waters. The lower Dungeness River (about RM 1.0, close to the mouth of the River) is on the 303d list for bacteria, pH, mercury, and arsenic exceedance (Washington State Department of Ecology 2012). The nearest proposed treatment reach is at RM 13.4. The Proposed Action is not expected to have impact on any of the exceedance parameters, in the lower watershed.

All project actions will follow applicable provisions of the Clean Water Act, and will be in compliance with Washington Department of Ecology State water quality standards for turbidity (WAC 173-201A).

A U.S. Army CORPS 404 permit will be acquired for placement of instream material prior to implementation of the project, if necessary.

Soil

Introduction

This report summarizes soil resource effects associated with the Dungeness Large Wood Enhancement project. Special emphasis was given to quantifying and presenting potential degree of detrimental soil disturbance due to project activities. A combination of GIS analysis, soil survey derived interpretations, and field validation was used to evaluate and report this project's effect on the soil resource.

Project Area Overview

Geology/Geomorphology

Soils in the project area formed predominantly in Continental glacial till deposits that are non-cemented, dense deposits derived from the Vashon ice sheets. These deposits are dominated by sandstone fragments from local sources. The primary landform associated with this project area is a relic proglacial lake that was formed by the damming action of a moraine or ice dam during the retreat of the Vashon ice sheet.

Soils

Soils within the project area are very deep and somewhat poorly drained with moderately slow permeability throughout profile. They were formed in residuum and colluvium from proglacial lake deposits and continental till on low relief, dissected uplands. Surface soils are moderately thick very gravelly sandy loams. Subsoils are thick, non-compacted very gravelly loams and very gravelly clay loams.

These soils were mapped as **548F8** – *Graywolf very gravelly sandy loam, 5 to 30 percent slopes*. (Olympic National Forest Area (WA632))

Cumulative Effects on the Soil Resource

Areal extent of soil disturbance within the project area is expected to be high initially, due to the nature of the tree removal with root wads attached and equipment operations within the units. However, *degree* of soil disturbance is expected to be slight and to not cross into the Class 3 soil disturbance threshold as outlined within the Forest Plan Standards and Guidelines and Regional Soil Quality Standards. It is expected that short term impacts will result but long term impacts will be ameliorated over time due to this specific soils inherit high soil resiliency to initial disturbance and high inherent ability to recover naturally from disturbance. A detailed analysis and breakdown of these concepts is contained below.

Site Degradation Susceptibility

This interpretation rates each soil for its susceptibility for soil degradation to occur during disturbance, which is a function of resistance to degradation. Resistance to degradation of a woodland site is a measure of its ability to function without change throughout a disturbance. The magnitude of decline in the capacity to function determines the degree of resistance to change. Resistance to degradation thus could be described as an area's buffering capacity. The ratings represent the relative risk of water and wind erosion, salinization, sodification, organic matter and nutrient depletion and/or redistribution, and loss of adequate rooting depth to maintain desired plant communities. See Figure Soil-1 and Table Soil-1 below for further explanation.

Figure Soil-1. Site Degradation Susceptibility.

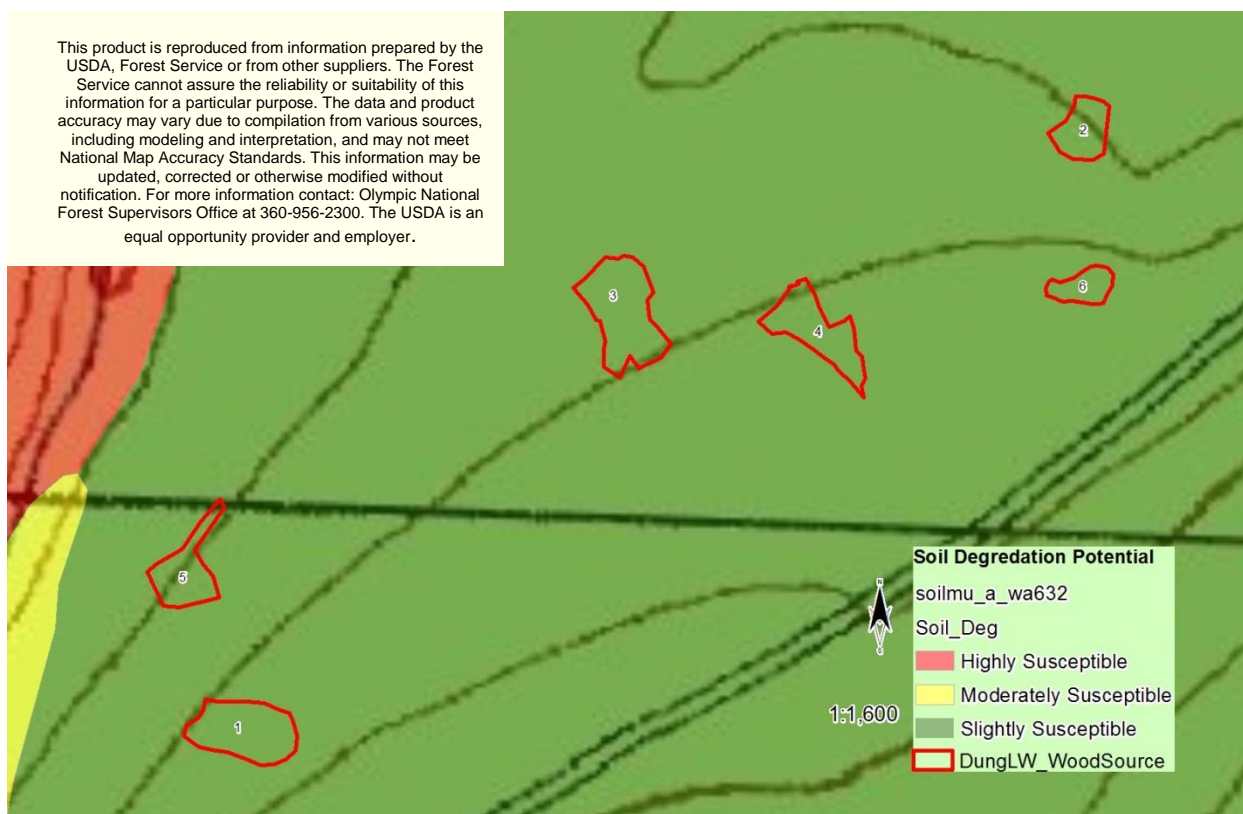


Table Soil-1. Site Degradation Susceptibility.		
Unit Number	Acres	Site Degradation Susceptibility Rating
1	0.40	Slightly susceptible
2	0.20	Slightly susceptible
3	0.49	Slightly susceptible
4	0.34	Slightly susceptible
5	0.26	Slightly susceptible
6	0.13	Slightly susceptible

Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the potential for degradation. "Highly susceptible" indicates that the soil has one or more features that are very favorable for degradation. "Moderately susceptible" indicates that the soil has features that are moderately favorable for damage to occur. "Slightly susceptible" indicates that the soil has features that generally make it unfavorable for degradation to occur.

Inherent Soil Restoration Potential

This interpretation rates each soil for its inherent ability to recover from degradation, which is often referred to as soil resilience. The ability to recover from degradation means the ability to restore functional and structural integrity after a disturbance. Both the rate and degree of recovery have been considered. Soil functions that are important include sustaining biological activity, diversity and productivity; capture, storage and release of water; storing and cycling nutrients and other elements; and providing support for plant and animal life. This rating categorizes soil resilience which in turn is dependent upon adequate stores of organic matter, good soil structure, low salt and sodium levels, adequate nutrient levels, microbial biomass and diversity, adequate precipitation for recovery, and other soil properties. See Figure Soil-2 and Table Soil-2 below for further explanation.

Figure Soil-2. Inherent Soil Restoration Potential.

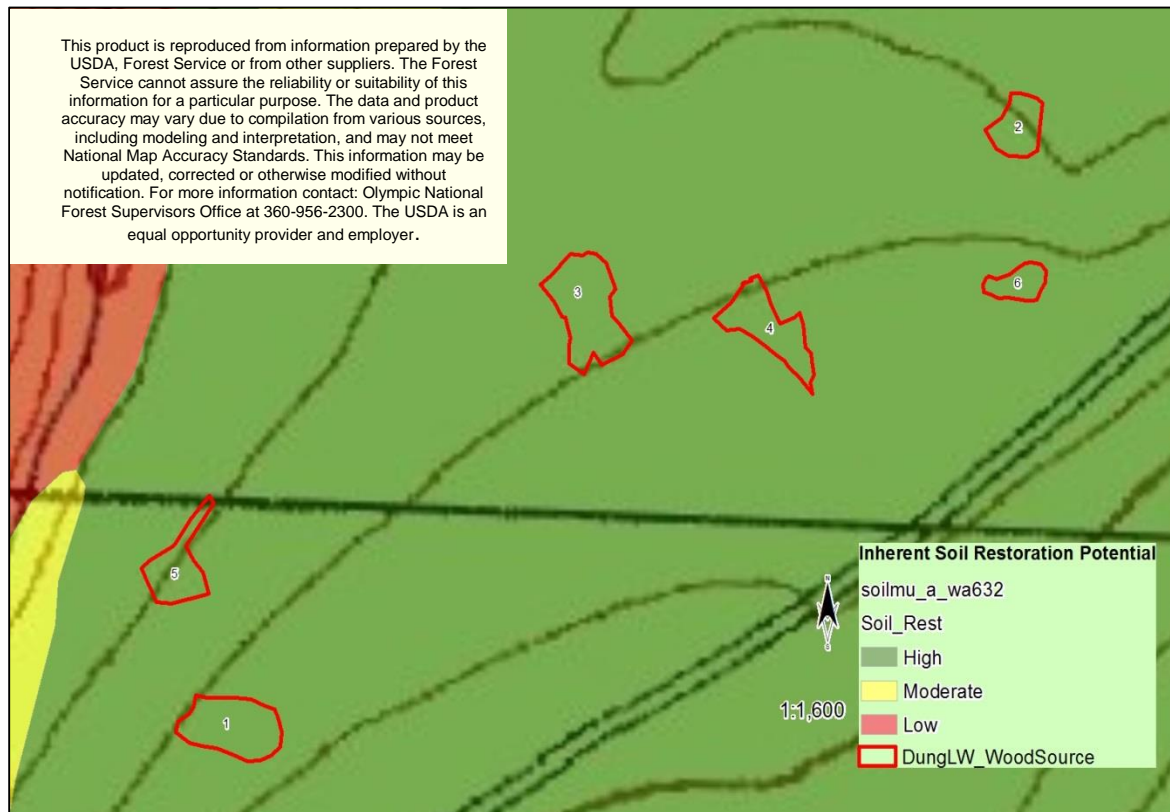


Table Soil-2. Inherent Soil Restoration Potential

Unit Number	Acres	Inherent Soil Restoration Potential Rating*
1	0.40	High potential
2	0.20	High potential
3	0.49	High potential
4	0.34	High potential
5	0.26	High potential
6	0.13	High potential

*Rating class terms indicate the extent to which the soils are made suitable by all of the soil features that affect the soil's ability to recover from ground disturbance. "High potential" indicates that the soil has features that are very favorable for recovery. Good performance can be expected. "Moderate potential" indicates that the soil has features that are generally favorable for recovery. Fair performance can be expected. "Low potential" indicates that the soil has one or more features that are unfavorable for recovery. Poor performance can be expected.

Wildlife

This report addresses the potential effects of the proposed Dungeness Large Wood Project on wildlife species and their habitats. Also included are recommendations for project design and mitigation. The following wildlife species groups were identified as concerns and are addressed: endangered, threatened, and sensitive species; management indicator species, migratory birds, and federal species of concern.

Direct, Indirect and Cumulative Effects of the Alternatives

No Action Alternative

Under the No Action Alternative, current conditions would be maintained. No wildlife habitat components would be disturbed or removed. There would be no effect to federally listed species and their designated critical habitats. There would be no impact to other wildlife, including sensitive species, species of concern, management indicator species, and migratory birds. Because there would be no actions producing direct or indirect effects, there would be no cumulative effects.

Proposed Action Alternative

Affected Environment - Federally Listed Wildlife Species

There are three wildlife species listed under the Endangered Species Act found in the Dungeness watershed: the marbled murrelet (*Bachyrampus marmoratus*), the northern spotted owl (*Strix occidentalis caurina*), and the Taylor's checkerspot butterfly (*Euphydryas editha tayloria*). The Taylor's checkerspot is listed as endangered (USDI 2013b), and the spotted owl and the marbled murrelet are listed as threatened (USDI 1990, 1992).

The project area and vicinity do not provide habitat for the Taylor's checkerspot, so this species will not be addressed further in the effects analysis. Taylor's checkerspot habitat includes prairies, balds and other dry open habitats with host and nectar plants.

The proposed large wood sites on the Dungeness River are adjacent to suitable habitat for the marbled murrelet and the spotted owl. Suitable spotted owl habitat is old growth or mature coniferous forest characterized by large trees and snags, multi-layered canopy, and down wood. Marbled murrelet habitat is old or mature forest containing large trees with platform limbs suitable for nesting. Recent surveys have not been conducted for either species in the project area, but surveys were done in the 1990s in the vicinity of the proposed large wood sites along the river. The project sites along the river are in close proximity to known marbled murrelet detections and 0.25 mile from the nearest spotted owl center (820 – Cat Creek).

The wood source units are not nesting habitat for the spotted owl nor the marbled murrelet. There were no suitable nest trees noted in the units or surrounding stand during field visits (3/14 - 12/14), although there were scattered legacy snags and downed wood. The wood source stand is located approximately 2 miles from the nearest northern spotted owl activity center (#847 – Deer Ridge), and 2.2 miles from nearest known murrelet detection. The stands do function as spotted owl dispersal habitat, defined as coniferous forest with at least a 40% canopy. The stand has a year of origin of 1920 and it is therefore about 94 years old. The nearest suitable nesting habitat is >0.5 mile from the proposed wood source units.

During helicopter activities the aircraft would move between the service landing(s), the rock collar landings, wood source units, and the river large wood sites; producing noise above ambient levels during the nesting season for the spotted owls and marbled murrelet. The wood source units and one of the proposed helicopter service landings are not within the harassment distance (Table 1) of suitable habitat for either species. The helicopter service landing closest to the Dungeness River, the flight lines, and proposed wood complex sites on the river are within the harassment distance of suitable habitat so would be exposed to noise disturbance during operations. Approximately **65** acres of marbled murrelet and owl suitable habitat would be exposed to noise disturbance from placing the wood via helicopter at the river sites. An additional estimated **70** acres suitable habitat would be exposed to noise along the helicopter flight lines between the service landing, rock collar landings, source units and wood sites. These acreages assume operations would be done during the early breeding season. Timing the operations after July 15th would reduce harassment.

Table Wildlife-1. Disturbance & disruption (harass) distance thresholds for marbled murrelets and spotted owls during the nesting seasons.

Project Activity	Harass Disruption Distance		
	Murrelet*	owl early season*	owl late season*
Chainsaws (includes felling hazard/danger trees)	110 yards	65 yards	NA
Heavy equipment	110 yards	65 yards	NA
Helicopter: Boeing Vertol 107	150 yards	150 yards	50 yards

*Marbled murrelet breeding season is April 1 – Sept. 23; spotted owl early breeding season: Mar. 1 - July 15; spotted owl late season: July 16 – Sept. 30.

Designated Critical Habitat for federally listed species

As required by the Endangered Species Act, the US Fish and Wildlife Service designated critical habitat for the northern spotted owl, marbled murrelet, and Taylor’s checkerspot (USDI 1996, 2012, 2013a). Critical habitat is defined as “lands that are considered essential for the conservation of a listed species.”

The source stand is the only portion of the project proposed for vegetation removal. It is not within marbled murrelet or Taylor’s checkerspot designated critical habitat unit, but is within a critical habitat unit for the northern spotted owl. Project activities would not remove primary constituent elements (habitat features that support nesting, roosting, foraging, and dispersal) of spotted owl critical habitat. The stand would continue to serve as dispersal habitat. The effects determinations for listed species and critical habitats are shown in the Table Wildlife-2.

Table Wildlife-2. Federally Listed Species and Critical Habitat Determinations.	
Species or Critical Habitat	Determination
Northern Spotted Owl	May Affect, Likely to Adversely Affect (Due to Harassment)
Marbled Murrelet	May Affect, Likely to Adversely Affect (Due to Harassment)
Taylor’s Checkerspot Butterfly	No Effect
Critical Habitat for Northern Spotted Owl	May Affect, Not Likely to Adversely Affect
Critical Habitat for Marbled Murrelet	No Effect

Table Wildlife-2. Federally Listed Species and Critical Habitat Determinations.

Critical Habitat for Taylor’s Checkerspot	No Effect
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The proposed project, including removal of trees at the source stand and installing the large wood structures in the river, is an action covered by the U.S. Fish and Wildlife Service programmatic Biological Opinions for Aquatic Habitat Restoration Activities in the States of Oregon and Washington (USDI 2013). Conservation measures in this document should be followed.

Regional Forester’s Sensitive Species

There are 24 terrestrial animal species on the Forest Service Region 6 Sensitive Species List (USDA 2011) that are known or suspected to occur on the Olympic National Forest (Table Wildlife- 3). Designation as “sensitive” means these species are given special management considerations to ensure their continued viability on National Forest lands. Based on a review of habitats and species sightings, four of these species have the potential to occur in the project area. These include the Van Dykes salamander, Olympic torrent salamander, harlequin duck, and bald eagle. The habitats of these species include streams and stream-side forests; therefore they may occur in the vicinity of the proposed large wood sites along the Dungeness River. The harlequin duck and the bald eagle have been observed in the vicinity. The wood source stand is not considered suitable habitat for terrestrial mollusks due to the lack of moist vegetation and debris that provide cool moist microhabitats. Mollusks might occur near the wood sites along the river, but would not be impacted by the project.

The action alternative may impact individuals or habitat for the Van Dykes salamander, Olympic torrent salamander, harlequin duck, and bald eagle, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the populations or species. The project will not impact other sensitive species.

Table Wildlife-3. Forest Service Region 6 Regional Forester’s Sensitive wildlife species documented or suspected to occur on Olympic National Forest.

Common Name	Scientific Name	Habitat	Known or Suspected in Project Area
Keeled Jumping Slug	<i>Hemphillia glandulosa</i>	Moist forests containing hardwoods, low veg., down wood, litter	No
Malone's Jumping Slug	<i>Hemphillia malonei</i>	Moist forests with down & decaying coarse wood, dense sword fern	No
Puget Oregonian	<i>Cryptomastix devia</i>	Moist forest containing hardwoods including maples	No

Table Wildlife-3. Forest Service Region 6 Regional Forester’s Sensitive wildlife species documented or suspected to occur on Olympic National Forest.			
Blue-gray Tailedropper	<i>Prophysaon coeruleum</i>	Moist forest with down wood, low vegetation, shrubs, litter and debris	No
Broadwhorl Tightcoil	<i>Pristiloma johnsoni</i>	Moist forest with abundant ground cover and litter	No
Makah Copper	<i>Lycaena mariposa charlottensis</i>	Wetland bogs containing <i>Vaccinium</i>	No
Johnson’s Hairstreak	<i>Callophrys Johnsoni</i>	Older hemlock forests containing dwarf mistletoe	No
Golden Hairstreak	<i>Habrodais Grunus</i>	Chinquapin stands	No
Olympic Arctic	<i>Oeneis Chryxus Valerata</i>	Alpine meadows with grasses	No
Valley Silverspot	<i>Speyeria zerene bremnerii</i>	Forest openings, prairies, grasslands, with flowing plants including <i>Viola</i>	No
Puget Blue Butterfly	<i>Plebejus icarioides blackmorei</i>	Prairies, grasslands, alpine meadows, containing lupine.	No
Lupine Blue Butterfly	<i>Plebejus (Icaricia) lupini spangelatus</i>	Alpine /subalpine dry meadows with flowering plants	No
Van Dyke's Salamander	<i>Plethodon vandykei</i>	Forests with down debris; streams & seepages	Yes
Olympic Torrent Salamander	<i>Rhyacotriton olympicus</i>	Forest streams with high gradient & coarse substrate.	Yes
Common Loon	<i>Gavia immer</i>	Lakes	No
American Peregrine Falcon	<i>Falco peregrinus anatum</i>	Nests on cliffs	No
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Large trees near water; stream-sides	Yes

Table Wildlife-3. Forest Service Region 6 Regional Forester’s Sensitive wildlife species documented or suspected to occur on Olympic National Forest.			
Harlequin Duck	<i>Histrionicus histrionicus</i>	Breeds along fast-flowing streams	Yes
Townsend's Big-Eared Bat	<i>Corynorhinus townsendii</i>	Roosts in large trees, under bridges; caves	No
Keen’s Myotis	<i>Myotis keenii</i>	Roosts in large trees, snags, rock crevices; caves	No
Pacific Fisher	<i>Martes pennanti</i>	Coniferous forest with large trees & snags, down logs, cover	No
Olympic Pocket Gopher	<i>Thomomys mazama melanops</i>	Subalpine / alpine meadows	No
Olympic Marmot	<i>Marmota Olympus</i>	Mountain meadows > 4000m elev.	No

Olympic National Forest Management Indicator Species

Management Indicator Species (MIS) is a species whose welfare is believed to be an indicator of the welfare of other species using the same habitat, or a species whose condition can be used to assess the impacts of management actions on a particular area (Thomas 1979). The Olympic National Forest Land and Resource Management Plan (USDA 1990) identified Management Indicator Species (Table Wildlife-4) for the Forest. Two MIS, the bald eagle and northern spotted owl, are addressed in other report sections and not discussed here.

Table Wildlife-4. Olympic National Forest Management Indicator Species.		
Management Indicator Species or Species Group	Habitat	Habitat Present?
Bald Eagle	Mature forest	yes
Northern Spotted Owl	Old growth/Mature forest	yes
Columbian Black-tailed Deer/ Roosevelt Elk	Balance of cover and forage; amount of vehicle disturbance	yes
Pileated Woodpecker/ American Marten	Mature coniferous forest	yes

Table Wildlife-4. Olympic National Forest Management Indicator Species.

Primary Cavity Excavators	Dead and dying trees	yes
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The wood source stand with its closed canopy, small openings, low elevation (<2500 feet) and gentle terrain, provides habitat year round for deer (*Odocoileus hemionus*) and elk (*Cervus canadensis roosevelti*). Deer use was observed in the stand. There could be short term negative impacts to individual deer and elk from disturbance, but potentially positive effects from creating openings increasing available forage.

The wood source units have scattered standing dead and dying trees which provide habitat for pileated woodpeckers (*Dryocopus pileatus*) and other primary cavity excavators. However the stand does not provide good quality habitat for cavity excavators and other wildlife associated with dead wood because the snag level is low. During field reconnaissance the snag density was estimated to be 1.5 snags per acre, which is less than 30% tolerance level for snag density used by wildlife species, according to DecAID, the decayed wood advisor for managing dead trees and down wood in forests of Washington and Oregon (Mellan-McLain *et al.* 2012). A small amount of woodpecker excavation was noted in the stand but there is virtually no nesting habitat for the pileated woodpecker which nests in larger trees. Retaining dead and dying trees and large trees is important for snag recruitment. There may be minor impacts to cavity excavators if standing dead/decaying trees are fallen during operations.

Minor impacts are possible to habitat for marten (*Martes Americana*) and other species associated with mature forest, from impacting dead & decaying trees or down wood during operations. These impacts are expected to be negligible, as the affected forest stand is low quality habitat with low levels of dead trees and large down wood. There are opportunities to create snags and CWD structures to improve wildlife habitat.

Migratory Birds

Executive Order (EO) 13186 signed by the President on January 10, 2001 defined the responsibility of federal agencies to protect migratory birds and their habitats. This Executive Order directs federal agencies to avoid or minimize the negative impact of their actions on migratory birds, and to take active steps to protect birds and their habitat.

The Olympic National Forest falls within Bird Conservation Region 5 Northern Pacific Rainforest, as designated by the US Fish and Wildlife Service (2008). Bird Conservation Regions (BCRs) are ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues. Migratory and resident bird species of concern have been identified for each BCR. Migratory birds of conservation concern in BCR 5 with the potential to be affected by this project (in the range and habitat) are listed in Table Wildlife-5. Resident birds of conservation concern in BCR 5 (bald eagle, marbled murrelet, northern goshawk) are addressed in other sections of this document.

Table Wildlife-5. Migratory Birds of Concern that Potentially Occur in Project Area, and Effects.		
Species	Habitat	Proposed Action Effects
Rufous Hummingbird	Forest edges and openings with a diversity of flowering plants.	Project may have positive effects from creating openings.
Olive-sided Flycatcher	Natural or man-made openings with tall trees or snags.	Minor impacts from felling trees, but may have positive effects from creating openings.
Purple Finch	Moderately moist open or semi open coniferous forests	No impacts anticipated.
Willow Flycatcher	Moist shrubby habitats; associated with willows	No impacts. Habitat does not occur in project area

U.S. Fish & Wildlife Species of Concern

Federal Species of Concern (USDI 1993) are species identified by the U.S. Fish and Wildlife Service that might be in need of conservation action. Actions may include monitoring of populations and threats as well as possible listing as threatened or endangered. There is no legal protection for species of concern, and the designation does not necessarily mean they will be listed. Implementing the action alternative would not contribute toward a need for conservation action for these species. The following table includes those species of concern not discussed elsewhere in this document.

Table Wildlife-6. Federal Species of Concern and Project Effects.		
Species	Habitat	Proposed Action Effects
Long-legged Myotis and Long-eared Myotis	Roost in cavities or bark crevices in large trees & snags, rock crevices; caves; mines.	No impacts due to lack of large trees / snags that provide roosting habitat
Northern Goshawk	Mature forests with larger trees, relatively closed canopies; and open understories.	No impacts anticipated; source stand is not quality habitat; lacks large trees
Tailed Frog	Fast, cold streams with cobble or boulder substrates, streambanks/ riparian.	May impact individuals potentially occur near river

Table Wildlife-6. Federal Species of Concern and Project Effects.		
Western toad	Breeds in ponds/shallow lakes, but may be found in terrestrial habitats, under woody debris/ in burrows.	Minor impacts to individuals possible
Cascades frog	Small lakes, ponds, moist forests, and other seasonally flooded or marshy areas; >2000' elevation.	No impact

Survey and Manage Species

Background information on Survey and Manage species is provided in Chapter 1. The Dungeness Large Wood Project meets Pechman exemption c because it is a stream improvement project that entails obtaining material for placing in-stream and the placement of large wood. The activity of removing trees for creation of log jams meets exemption a, as stands proposed as wood source are younger than 80 years old. Survey and manage surveys are not required for this project.

Silviculture

Background and History

The proposed project will remove trees from selected stands for the construction of log jam structures within the active channel of the Dungeness and Gray Wolf Rivers. The vegetation that would be affected by the project is within the stands proposed for tree removal, so this report will only address those stands and will not include analysis of proposed in-channel activities.

The project area is located within the Dungeness River watershed; the legal location is T29N R4W Section 27. The land allocations designated by the Northwest Forest Plan are Adaptive Management Area and Riparian Reserve, and the Olympic National Forest Forest Plan (USDA 1990) designation is F1-Municipal Watershed (City of Sequim).

Historic large fires and timber harvesting (in the more recent past) have been the dominant disturbance agents within the project area. Historic large fires are estimated to have occurred every 200 years across the entire watershed, followed by smaller fires occurring in the period from about 1890 to 1930 (USDA 1995). Clearcut timber harvesting began about 1940 on Forest Service ownership in the watershed and continued until about 1993 (USDA 1995).

The project stand (Compartment 2601 Cell 44) originated in about 1920 following wildfire. In 1990, the stand was commercially thinned to an average spacing of about 18 feet.

Current Conditions

Stand conditions were assessed by a combination of fixed radius plots (for tree data) and walk-through exams. The data gathered included overstory tree and stand level characteristics, snag abundance, understory plant and tree species abundance and probable

plant associations. The productivity of the stand is generally low to moderate (Site Class IV). The overstory of the stand is generally dominated by Douglas-fir, but in patches western hemlock composes a significant proportion of the overstory trees. Minor overstory tree species include western redcedar, northern black cottonwood and red alder. Estimated crown cover ranges from 80% to 90% and understory vegetation ranges from 50% to 80% cover, predominately salal. The stand best fits within the TSHE/GASH (Western hemlock/salal) plant association. The stand has approximately 256 trees per acre, 232 square feet of basal area per acre and a quadratic mean diameter of 12.9 inches. The calculated Stand Density Index (SDI) (Reinecke, 1933) for the stand is 384, which is close to 65% of maximum for Douglas-fir, placing the stand within the zone where significant tree mortality occurs due to competition (greater than 55%) (Long 1985). On average, there are approximately 100 understory trees per acre, which are primarily western hemlock although scattered western redcedar are present. There are currently about 20 small snags (5 to 19.9 in DBH) per acre with few larger snags.

Symptoms of infection with *Armillaria* root disease (*Armillaria ostoyae*) was noted on scattered individual live trees in most stands, and on recently dead trees. In western Washington and Oregon, tree mortality caused by *Armillaria* has most often been associated with Douglas-fir plantations less than 30 years of age, and with trees exhibiting low vigor (Shaw et al. 2009). Observations of trees exhibiting symptoms of infection and recent mortality in these stands confirmed that most of the affected individuals were trees of low vigor (in the intermediate or suppressed crown classes) which were stressed by density-related competition for resources. Windthrow of individual trees and small groups of trees was also associated with the occurrence of root disease within the stand.

Management Direction

Northwest Forest Plan direction for the AMA includes:

Develop, demonstrate, and test techniques for:

1. Creation and maintenance of a variety of forest structural conditions.
2. Restoration of structural complexity and biological diversity in forests and streams that have been degraded by past management activities.
3. Restoration and maintenance of forest health using controlled fire and silvicultural approaches.
4. For the Olympic AMA (D-16): Develop and test innovative approaches at the stand and landscape level for integration of ecological and economic objectives, including restoration of structural complexity to simplified forests and streams and development of more diverse managed forests through appropriate silvicultural approaches.

Desired Future Condition

The objectives within stands proposed for treatment (gap creation) would be to add structural and spatial diversity, increase the diameter and crown growth of individual trees adjacent to gaps and to promote the growth and persistence of understory seedlings/saplings, shrubs, and herbs within gaps.

The long-term objective would be to add structural and spatial diversity to the stand, including many of the characteristics that are desired for late successional/old growth forest within the next 60 to 100 years or so, both for habitat values within the stand and nearby stands within designated LSR. These characteristics have been described as stands that exhibit high crown closure with a patchy, multilayered canopy and trees of several age classes; a variety of herbs, shrubs, and coniferous tree seedlings and saplings on the forest floor; large diameters among the overstory trees (exceeding 36 inches DBH) with broken tops and other indications of old and decaying wood in some of them, and a range of diameters and ages among the understory trees; and large standing dead trees (>4 per acre over 20 inches DBH and 15 feet tall, and as many as 12 per acre), and CWD (15-20% ground cover) (Franklin et al. 1986; and Carey and Johnson 1995).

Silviculture and Stand Development

Given the current condition of the stands proposed for treatment, silvicultural treatments are recognized by the Forest Plan as a beneficial activity which can be used to promote the development of late-successional characteristics and allow more rapid attainment of desired future conditions.

In general, the stand proposed for a gap creation treatment exhibits substantial understory vegetation cover which has been enhanced by previous thinning treatment, however as the overstory trees expand their crowns and re-close the canopy, the understory trees and vegetation will decrease in abundance and vigor. The previous commercial thinning treatment was a thinning from below (smaller trees were removed) that resulted in relatively uniformly spaced stands. A number of researchers emphasize the inclusion of “skips” (unthinned patches), “gaps” (small openings), and heavily thinned areas in thinning treatments, otherwise known as “variable density thinning” (Carey and Curtis, 1996; Muir et al, 2002). Canopy gaps would add a component of spatial and structural diversity that is currently lacking within stand proposed for treatment. The created gaps would allow the persistence of understory vegetation into the future and encourage development of a patchy second canopy layer. Increased resources available to the overstory trees adjacent to canopy gaps would result in increased vigor, diameter growth and crown development.

Proposed Treatment

The project would create approximately 2 acres of gaps within the 53 acre stand proposed for treatment. This would represent about 5 percent of the stand area in gaps. Canopy gaps up to about 0.5 acre in size would be created through the uprooting or cutting of trees of all sizes and species. There would be no upper diameter limit on trees designated for removal. Preference for gap placement would be given to locations adjacent to existing areas of past soil disturbance, such as unclassified or decommissioned roads, skid trails or landing sites. Gaps would be located outside of Riparian Reserves and away from open system roads, snags >16 in DBH and individual hardwood trees greater than 12 in DBH to the extent feasible. Locations chosen for gaps would not include suitable nest trees for marbled murrelet or individual western white pine trees greater than 8” DBH.

Following installation of the gaps and removal of the trees for construction of in-stream structures, the planting of approximately 50 TPA of rust resistant western white pine seedlings within the created gaps would increase tree species diversity within these stands.

Future Treatment Needs:

Stand examinations should be performed about 10-15 years following treatment to determine the necessity for additional treatments that would contribute to the development of the desired late-successional characteristics within the stand. The planted western white pine trees should be assessed for a first pruning treatment to reduce mortality due to white pine blister rust. A second commercial thinning treatment may be warranted to reduce tree density and continue the development of desirable overstory tree characteristics and the vigor of understory trees and vegetation. Additionally, if the understory trees are of sufficient size and density, an understory thinning treatment could promote the development of multiple canopy layers.

No Action Alternative

Direct and Indirect Effects

Under the No Action Alternative, the approximately 53 acre second-growth stand would not be treated.

The No Action Alternative would have no direct effects on stand development. The indirect effect of the No Action Alternative, however, is that the stand would continue through the stand development process without intervention, and late-successional habitat for old-growth dependent species would not be accelerated.

The No Action Alternative would not violate any standards and guidelines, but would forego opportunities to use thinning or gap creation to meet habitat objectives. Since the stand would not be treated, trees would not be available for the construction of the LWD structures critical to meeting the purpose and need of the project.

Action Alternative

The action alternative would increase spatial and structural diversity within the chosen stand, and would likely improve habitat conditions for late-successional species on approximately 53 acres by accelerating stand development.

Direct and Indirect Effects

Gap creation would directly promote the development of late-successional characteristics by:

1. Enhancing horizontal and vertical spatial diversity within the stands by creating canopy gaps; and
2. Transferring part of the stands' growth potential from the upper canopy to the forest floor within and around canopy gaps

The indirect effects include:

1. Accelerating tree growth for the development of large trees, snags, and coarse woody debris; and
2. Allowing the increase and diversification of understory vegetation as well as introducing a second canopy layer.

Cumulative Effects

As detailed in the description of historic management activities, considerable vegetation management has occurred within the watershed and the stand proposed for treatment. The proposed gap creation would enhance the beneficial effect of the previous commercial thinning treatment and promote the development of habitat characteristics that are found in fully functioning late-successional/old growth forest within the stand. The project would expand the acreage within the watershed that has received silvicultural treatment to enhance habitat characteristics and promote development of late-successional structure, although the proposed treatment would not have a measureable effect at the landscape scale given the small scale of the project.

Botany and Invasive Species

Federally Listed Species

There are two Endangered or Federally listed, Candidate, or Proposed vascular plants, bryophytes, fungi or lichens documented or suspected on the Olympic National Forest. One of these is the Federally listed Endangered vascular plant, *Arenaria paludicola* (Marsh sandwort), that was suspected to occur on the Olympic National Forest, but is now considered potentially extirpated from the state of Washington (USDA Forest Service, Pacific Northwest Region, Federally Listed, Proposed and Candidate Species, and Proposed or Designated Critical Habitat, January 2008). This species was removed from the most recent Region 6 Regional Forester Special Status Species List, dated December 1, 2011.

The second, Whitebark pine (*Pinus albicaulis*), is an R6 Sensitive Species and a Federal Candidate species under the Endangered Species Act. It occurs in subalpine habitats above 5,000 feet in the Buckhorn Wilderness on the Hood Canal Ranger District of the ONF. The US Fish and Wildlife Service issued their twelve (12) month finding on a petition to list whitebark pine as a threatened or endangered species on July 19, 2011, in Federal Register Volume 76, Number 138. The finding was that of “warranted but precluded” with a Listing Priority Number (LPN) of 2. The Listing Priority Number of 2 indicates that the species has a very high priority for listing as threatened or endangered because of eminent threats to the species.

Whitebark pine is long-lived, cold-tolerant, five-needle pine of high elevations. It is a keystone species, important to numerous species of wildlife, including Clark’s nutcracker (*Nucifraga columbiana*) its seed dispersal agent. Major threats to the persistence of whitebark pine are an exotic fungus, white pine blister rust (*Croartium ribicola*), mountain

pine beetle (*Dendroctonus ponderosae*) infestations, succession, fire and fire suppression, and climate change (Aubry et al. 2008).

Effects Common to All Action Alternative

Direct, Indirect, and Cumulative Effects

There are no known current or historical sites of *Arenaria paludicola* or *Pinus albicaulis* within the proposed project area, and due to lack of suitable habitat, both species are not likely to occur there. Therefore, under all alternatives there would be no direct, indirect or cumulative effects to either species, nor would implementation of this project affect the viability of either species.

Sensitive Species

Effects Common to All Action Alternative

Direct, Indirect, and Cumulative Effects

Vascular Plants

As no occurrences of sensitive vascular plants were found in the project area, and no sensitive species of vascular plants have been documented in the project area, there would be no direct, indirect or cumulative effects to these species. Implementation of either alternative would have no risk to species viability or a trend toward listing.

Bryophytes

As no occurrences of sensitive bryophytes were found in the project area, and no sensitive species of bryophytes have been documented in the project area, there would be no direct, indirect or cumulative effects to these species. Implementation of either alternative would have no risk to species viability or a trend toward listing.

Fungi

As no occurrences of sensitive fungi were found in the project area, and no sensitive species of fungi have been documented in the project area, there would be no direct, indirect or cumulative effects to these species. Implementation of either alternative would have no risk to species viability or a trend toward listing.

Lichens

As no occurrences of sensitive lichens were found in the project area, and no other sensitive species of lichens are documented in the project area, there would be no direct, indirect or cumulative effects to these species. Implementation of either alternative would have no risk to species viability or a trend toward listing.

Cumulative Effects

In the past 80 years, the units proposed for tree removal have been clearcut and replanted. It is reasonable to assume that lichen species richness, in general, declined in these areas as a result of this habitat loss and fragmentation. Further detrimental effects on bryophyte and lichen diversity that could result from the current proposed project will be reduced or eliminated by incorporating the mitigation measures described in this document. Therefore, cumulative effects would be negligible.

Invasive Plants

Surveys were conducted in September, 2014 and very few weeds were observed in the project area. In all cases, they were observed along system roads that will be used to access the units, and to a lesser extent on the overgrown skid trails and closed roads that lead into the units. Tansy ragwort, everlasting peavine, and Canada thistle were the only species observed on the closed roads/skid trails inside the boundaries of the units proposed for harvest. All three species were very sparse and patchy in these areas.

Infestations of several species of weeds occur along the edges of the system roads (2875 and 2878) associated with the proposed units. The most worrisome of these include herb Robert (*Geranium robertianum*), knapweed (*Centaurea* spp.) and tansy ragwort (*Senecio jacobaea*). Infestations are scattered and sparse, however, and easily avoided. Eradication efforts of these weeds have been underway for several years, and will continue to be monitored into the future.

Direct and Indirect Effects

No Action Alternative

The no-action Alternative would not change the current condition of invasive plant species in the project area.

Proposed Action Alternative

Under the proposed action, there would be ground disturbance and newly exposed soil where roads are reopened and used for accessing the units, and in the newly created forest gaps that would result from the removal of whole trees within the proposed units. These areas would be susceptible to invasive plant colonization, particularly since there are already invasive species documented in adjacent areas that could provide a ready seed source. In order to control noxious weed colonization and spread under the proposed action, prevention and weed eradication activities will be implemented before, during and after project activities.

Since the completion of the surveys associated with this project, all of the system roads associated with this project have been treated with the intent of controlling or eradicating weeds of concern in the area. Closed roads and old skid trails associated with the proposed project have not been treated for weeds in the last 5 years, but areas where weeds have been observed on these roads are scheduled to be treated either prior to or following the completion of this project. All roads associated with the project will continue to be treated and monitored into the future as necessary. Implementation of the proposed project with

mitigations (listed in Chapter 2) would ultimately provide positive results in the prevention of invasive plant spread and treatment of current infestations.

Cumulative Effects

Many activities occurred in the past that contributed to the establishment and spread of invasive plants in and adjacent to the proposed project area. The implementation of this project with appropriate mitigation measures will not contribute to the existing problem, and will have a positive effect on preventing the spread of invasive plants and on control or eradication of current infestations.

Recreation

Proposed Actions and Alternatives Analyzed

The proposed action consists of the installation of stable log jams within or adjacent to the active channel in the middle Dungeness and lower Gray Wolf Rivers (See Chapter 1 for location details). The log structures would be designed to simulate natural log jams and accelerate the recovery of channel processes, riparian conditions, and fish habitat. For more details on the proposed action refer to chapters one and two.

Methodology

Detailed Methodology

A combination of GIS analysis, and professional judgment was applied to perform the analysis in this section. The scope of the analysis includes the planning area as well as all recreation areas and opportunities in those areas that are affected by project activities.

Analysis Indicators

- Access impacts to recreational opportunities as a result of project actions.
- Safety impacts to recreational boaters as a result of project actions.

Spatial and Temporal Bounding of Analysis Area

Effects to recreation resources are assessed at the planning area scale, specifically within the middle Dungeness River and Lower Gray Wolf River subwatersheds. Spatial bounding also includes all recreation areas whose access depends on road corridors that will experience effects from proposed project operations. These recreation sites include the Lower Gray Wolf trail and trailhead, the Put-in trail and trailhead, and the Dungeness Forks Campground. The temporal bounding of the analysis will primarily focus on time periods in which on-the-ground project operations take place, as well as long-term residual effects to recreation opportunities that occur as a result of project operations.

Affected Environment

The affected environment includes areas of Forest Roads 2878, 2870 and attached spur roads which would be closed for up to two days as a result of proposed project activities. These sections include the portion of the 2870 road east of the junction with F.S. Road 2878 to the junction with F.S. Road 2880 (6.2 miles). This section of road is classified in the Recreation Opportunity Spectrum (ROS) class as “Roaded Modified” (USDA 1990). This class provides the opportunity to experience, “areas that are characterized by predominantly natural-appearing environments with high evidence of the sights and sounds of humans. Such evidence may not harmonize with the natural environment. Interaction between users may be moderate to high, with evidence of other users prevalent. Resource modification and utilization practices are evident and may not harmonize with the natural environment” (FEIS, III - 101). This section of road (6.2 miles) and attached spur roads (6.1 miles) provides access to opportunities which include: dispersed camping, fishing, photography, recreational driving, nature viewing, hiking, and backpacking. This road provides access to the popular Gray Wolf trail, which enters the Buckhorn Wilderness and terminates at approximately 4.7 miles. Day hiking is most popular on this trail but opportunities for backcountry camping are also present. Recreational use in this area is moderate to high depending on the time of year.

Forest Service Road 2878 (4 miles) and its spur roads (8.3 miles) would also be closed for up to two days as a result of project operations. The majority of this area is located within ROS class “Roaded Modified”. About 1 mile of spur roads are located in the “semiprimitive non-motorized” ROS class. This class is defined in the Forest Plan as, “a natural or natural-appearing environment has been maintained.

Campsites, sanitation facilities, and other management activities are not conspicuous. The area affords visitors an experience mostly free from the sights and sounds of other people” (Forest Plan, IV-63). Forest Road 2878 and its spur roads contain opportunities for dispersed camping, nature photography, recreational driving, nature viewing, and hiking. Access to the Ned Hill trail is located on the 2878 road. This primitive trail ends at a historic Forest Service fire lookout after traveling approximately 1.1 miles on the trail. Recreation use on the 2878 road is low to moderate.

River access and conditions for recreational kayakers on the lower Gray Wolf and the middle Dungeness Rivers would also be affected as a result of project operations. Access to the river by recreational fishermen, and kayakers would be prohibited on specific stretches of the river during the installation phase of proposed project operations. Recreational kayaking is present on the Dungeness River and Gray Wolf Rivers. A run on the Dungeness River includes putting in at the confluence with Gold Creek and taking out at the Dungeness Forks Campground. This route receives low use. Another route on the Dungeness includes putting in at the Dungeness Forks Campground and taking out near the fish hatchery road downstream of the F.S. boundary. This route receives moderate use. A route on the Gray Wolf River begins within the Buckhorn Wilderness or National Park along the Gray Wolf River and takes out where the Gray Wolf River flows under F.S. Road 2870, or at the Dungeness Forks Campground. This route receives low use. Initial scoping revealed safety concerns were present within the kayaking community concerning placement and design of log jams.

Environmental Consequences

Alternative 1 – No Action

This alternative is the no action alternative. The discussion of direct, indirect and cumulative effects of this alternative on the recreation resource is provided below.

Direct Effects and Indirect Effects

If there is no action, there would be no direct effects to the recreation resources in the project areas. There will be no recreation access impacts, and river conditions for kayakers would be unaffected by management actions. Kayakers would continue to encounter downed logs and transitory log jams in these river segments due to natural processes.

As a result of no action, suitable fish habitat would experience no meaningful improvement over the foreseeable future. Thus, an indirect impact would include the absence of significant recreational fishing opportunities in the foreseeable future, as well as the continuation of limited opportunities for aquatic wildlife viewing opportunities within the affected areas.

Cumulative Effects

Under the No Action Alternative, no additional man-made log jams would be placed in the project reaches which could create obstacles or safety hazards for recreational kayakers. Kayakers would continue to encounter downed logs and transitory log jams throughout the watershed due to natural processes.

Cumulative effects of the no action alternative include a very slow fish habitat restoration process on the lower Gray Wolf and middle Dungeness rivers. With the lack of adequate large woody debris along the river to provide fish habitat, the area will likely continue to experience low returning numbers of chinook, steelhead and bull trout with limited sportfishing opportunities.

Alternative 2 – Proposed Action

The proposed action consists of the installation of stable log jams within or adjacent to the active channel in the middle Dungeness and lower Gray Wolf Rivers. The proposed action is detailed in chapters one and two. A discussion of direct, indirect and cumulative effects of this alternative on the recreation resource is provided below.

Direct and Indirect Effects

Direct effects of the proposed action on recreation include a closure period in the project area lasting no more than two days. The closure would be implemented to protect visitor safety during log transportation (via helicopter) and installation activities. The closure would affect access to the portion of the 2870 road east of the junction with F.S. Road 2878 to the junction with F.S. Road 2870, this would affect spur roads as well. Forest Service Road 2878 and its spur roads would also be closed for up to two days as a result of project operations. The road closures would temporarily close access to the Ned Hill trail and the lower Gray Wolf trail.

The closure would be implemented sometime between the months of July and August. Closure notices would be posted on site, on the forest service website, and other outlets well before the closure is to be implemented. The closure would be implemented during the weekday in order to reduce impacts of closing access because recreation use on Olympic National Forest is generally highest on weekends.

Reaches of the Gray Wolf and Dungeness Rivers in which log jams are installed will also be closed for up to two days in order to protect public safety. Kayakers, fishermen and other recreationists may be affected by this 1-2 day closure. Kayakers typically would not be expected to float the river during the low streamflows which would be present during the log jam construction period.

The Dungeness Forks Campground will remain open during project operations. During this time the sound of helicopters may be present. The 2870 road will remain open beyond the 2880 junction, in the direction of the Tubal Cain and Upper Dungeness trailheads. Sights and sounds of helicopters will be present during log transportation and installation for approximately one to two days. However, these management practices will be carried out in short time, creating minimal impacts to recreation in the project area. The project actions also appear consistent with the ROS class designated in the area, “roaded modified”, especially considering the short duration in which they will occur. The 2880 junction will also remain open, enabling continued access to popular recreation areas along the upper reaches of the Dungeness watershed. However, this will limit access to the upper reaches of the Dungeness watershed via F.S. road 2870 to passenger vehicles, as the 2880 access to the upper Dungeness valley is not recommended for campers or trailers.

Fifteen log jams consisting of large wood would be installed on portions of the Gray Wolf and Dungeness Rivers. The jams would be anchored with large boulders connected by short cables. The installations would closely mimic the appearance of natural log jams and thus would be consistent with the ROS classes of “roaded modified” and “roaded natural” in which the log jam installations are located.

The constructed log jams would present added obstacles and increased hazards for recreational kayakers and affect the runs detailed in the affected environment section above. Various design elements will be implemented in order to ensure proposed log jams do not create dangerous conditions for recreational kayakers. All jams will be located within unconfined areas of the river and along the margins of travel; there will be no channel spanning jams installed. The jams will be engineered in such a way as to provide ample room to allow kayakers to safely navigate around them. The log jams will be placed in unconfined reaches of the rivers, enabling kayakers to safely portage around the log jams if individuals are more comfortable bypassing them using that method. Additionally, the jams will be installed in low gradient areas, avoiding blind corners, thus the river environment would be generally less technical to navigate around the jams and allow proper site distance for route planning. In order to mitigate the possibility of cable anchors becoming loose in the river and causing hazards for kayakers, constructed log jams will be inspected yearly. If the hazardous cables are found in the log jams, the cables will be removed from the river.

Cumulative Effects

Cumulative effects include a temporary closure on select roads and general river access within the Dungeness watershed. These closures will subsequently close access to the Lower Gray Wolf trail and the Ned Hill trail. Additionally, other recreational opportunities in the closure areas will be limited such as kayaking, backpacking, nature viewing, and dispersed camping. The cumulative effects however, will be minimal as the closure will last for no longer than two days and will occur on weekdays where recreation use is generally lower as opposed to weekends.

Kayakers would continue to encounter downed logs and transitory log jams throughout the watershed due to natural processes. Effects of the proposed action on kayaker safety and access would be minimal. The jams would be installed within low gradient, unconfined reaches of river, along the margins of travel. None of the jams would span the river channel. Blind corners would be avoided in order to provide proper site distance for kayakers to plan their route. These design elements should allow kayakers to navigate safely beyond the jams due to the relatively slow river flow found in low gradient areas and because the jams would be located near the river edges. Since the jams would be located in unconfined reaches, kayakers should be able to portage around the jams if safety becomes a concern.

Compliance with law, regulation, policy, and the Forest Plan

Under the proposed alternative, the Forest Plan will be met as it pertains to recreation resources within the project area.

Visual Impact

The 1990 Olympic National Forest Land and Resource Management Plan (Forest Plan) (USDA 1990) established Visual Quality Objectives (VQOs) for all areas of the forest. The project area for the Dungeness Large Wood Enhancement Project lies within Forest Plan Management Prescription Municipal Watershed. The tree removal, wood source units fall within the VQO of Modification (“Management activities may dominate the characteristic landscape”). All log jams and landing areas fall within the Retention VQO “Management activities should not be evident but remain visually subordinate to the characteristic landscape”. The wood source stand and the project reaches and surrounding river corridor areas currently meet this VQO.

No Action Alternative

Direct, Indirect, and Cumulative Effects

The No Action alternative would not change the current scenic conditions in the project area. Because there would be no project activities, there would be no indirect, direct, or cumulative effects to visual quality to combine with the effects of past, present, or foreseeable future actions.

Proposed Action Alternative

Direct, Indirect, and Cumulative Effects

Wood removal in the wood source units would maintain the intent of the Modification VQO. The large wood structures proposed for this project would be designed to mimic the natural processes of large wood accumulation, and are intended to look like natural in-stream features as they age. Once implementation of each reach is complete, and the structures age for a couple of years, the structures in that reach would be difficult to discern from naturally occurring large wood jams. The project area would continue to maintain its Retention VQO.

Timber harvest and road building has impacted visual quality in the planning area. There is no timber harvest currently proposed for the planning area, and there are no current or foreseeable activities on federal lands in the watershed that would impact visual quality objectives. This project would have no cumulative impact when combined with the effects of other projects.

Wild, Scenic, and Recreational Rivers

Introduction

Management of the Dungeness River and the Gray Wolf River on the ONF is governed by the 1990 Forest Plan. Portions of the Gray Wolf and Dungeness Rivers are within Management Prescription A4A – Wild, Scenic, and Recreational Rivers and the Late Successional Reserve Management Allocation. The Wild and Scenic Rivers analysis process, in general and as applied to Dungeness and Gray Wolf Rivers, is described below to provide information on the important values of these Rivers.

Olympic Forest Plan Wild and Scenic River Analysis

As part of the forest planning process for the Forest Plan and as required in the Wild and Scenic Rivers Act of October 1, 1982, and USDA-USDI Guidelines for Eligibility, Classification and Management of River Areas (September 7, 1982), seventeen rivers that originate in or flow through or have a portion of the river corridor within the Olympic National Forest System were evaluated for their potential for inclusion in the National Wild and Scenic Rivers System.

Each river was evaluated to determine its eligibility, that is if the river is free flowing and its adjacent land area possesses an “outstandingly remarkable” value. Those rivers which were determined to be eligible were then evaluated to determine the appropriate classification for each river segment. Both the Dungeness and Gray Wolf Rivers were determined eligible as a result of this analysis process. A suitability analysis was conducted for eligible rivers. Based on this analysis, certain rivers were recommended for addition to the Wild and Scenic Rivers System. A summary of the eligibility and suitability analyses for the Dungeness and Gray Wolf Rivers is provided below.

Dungeness Wild and Scenic Rivers Analysis

The main stem of the Dungeness River is about 28.1 miles long. Slightly over half of its distance (14.7 miles) is within the ONF boundary, with the exception of 0.5 miles which flows through private land, the entire distance within the boundary follows over National Forest land.

The eligibility determination process for the Dungeness River resulted in the identification of two “outstandingly remarkable” values: scenic and fish. Noted scenic values are high, open ridges, excellent views of Olympic Mountains, snowfields, cascading water, and narrow river canyons. Fish values include chinook coho and pink salmon as well as a unique early pink salmon run. In addition steelhead, sea-run cutthroat are also noted as outstandingly remarkable fish values. The Dungeness River meets the eligibility criteria from RM 10.5 to its source, a distance of 17.6 miles. In the Forest Plan planning process the determination was made that suitability analysis should proceed.

Gray Wolf Wild and Scenic Rivers Analysis

The Gray Wolf River is about 17.4 miles long; 9.4 miles of this is within the Olympic National Park and 8.0 miles is within the Olympic National Forest.

The eligibility determination process for the Gray Wolf River resulted in the identification of three “outstandingly remarkable” values: scenic, fish, and geologic. Noted scenic values are high, open ridges, excellent views of Olympic Mountains, snowfields, cascading water, and narrow river canyons. Fish values include chinook coho and pink salmon as well as a unique early pink salmon run. In addition steelhead, sea-run cutthroat, and the river’s status as a resident fishery are also noted as outstandingly remarkable fish values. Geologic values are mountain peaks, narrow canyons, cliffs, rock-faces, “rain shadow”, waterfalls, and whitewater cascades. The Gray Wolf River meets the eligibility criteria from its source to its confluence with the Dungeness River for a total of 17.4 miles. In the Forest Plan planning process the determination was made that suitability analysis should proceed.

Suitability and Recommendations for the Dungeness and Gray Wolf Rivers

Suitability analysis was based on seven criteria. These criteria included items such as representation of river conditions and major ecosystems found on the Olympic Peninsula, compatibility with existing uses, and support or opposition. The suitability analysis resulted in the recommendation of portions of both Rivers for designation in the Wild and Scenic River system (Table WSR-1).

Table WSR-1. Segments of river recommended for Designation as Wild and Scenic.			
River	Classification	Length	Description
Dungeness	Wild	4.1	Confluence of Milk and Heather Creeks in NW ¼ of Sec. 23, T27N, R4W to 2860 road bridge in NW ¼ of Sec. 31, T28, R4W.
Dungeness	Scenic	1.9	2860 road bridge to Silver Creek in SW ¼ of Sec. 19, T28N, R3W.

Table WSR-1. Segments of river recommended for Designation as Wild and Scenic.			
Dungeness	Wild	2.8	Silver Creek to Sleepy Hollow Creek in NW1/4 of Sec. 8, T28N, R3W.
Dungeness	Scenic	5.9	Sleepy Hollow Creek to Olympic NF boundary.
Gray Wolf	Wild	6.8	Olympic National Park boundary to 2870 road bridge in NW1/4 Sec. 31, T29N, R3W.
Gray Wolf	Scenic	1.2	2870 road bridge to confluence with Dungeness River.

Forest Plan Consistency

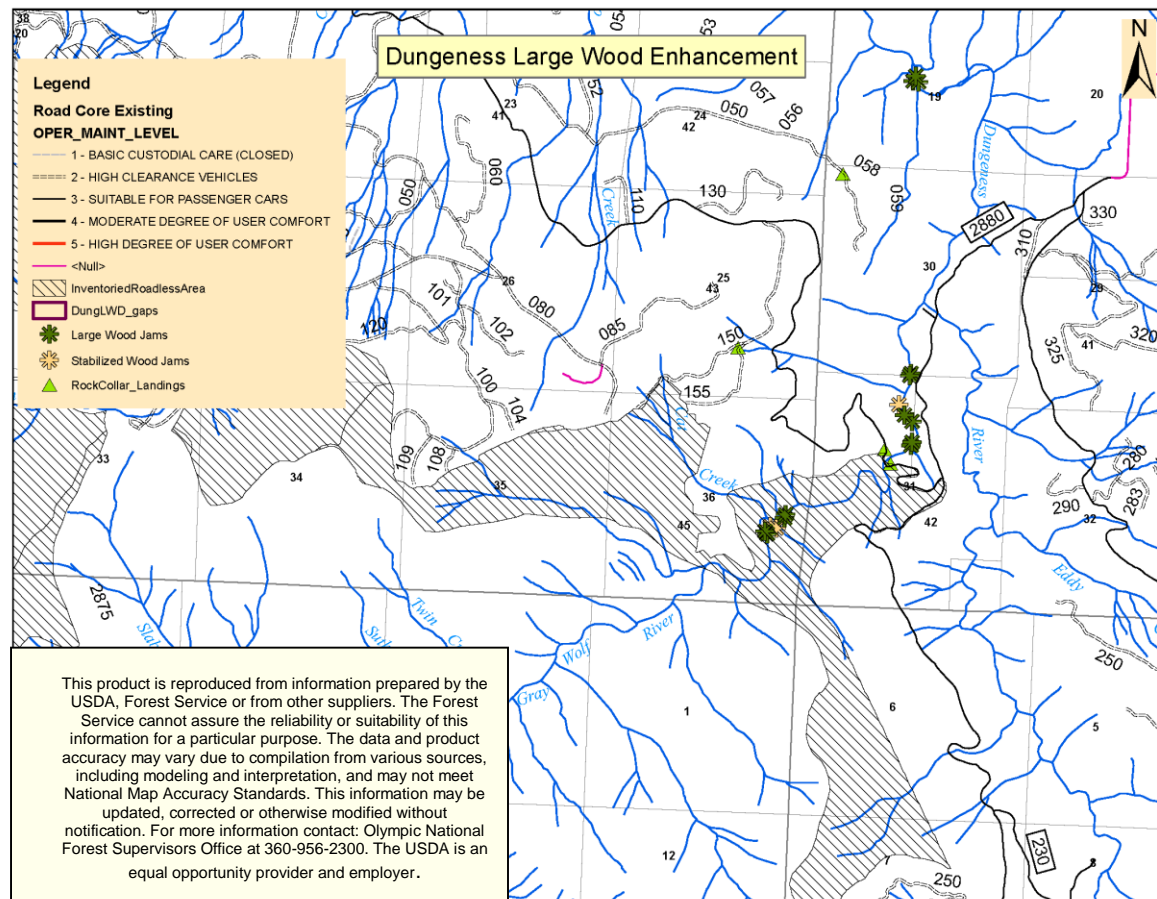
Because the large wood structures proposed for this project would be designed to mimic the natural processes of large wood accumulation, they would be difficult to discern from naturally occurring large wood jams as they age. As a result, the proposed project activities would retain or enhance the recommended scenic and wild values in line with the stated Forest Plan goal for Wild Scenic and Recreational Rivers Management Allocation A4A (Forest Plan, pg. IV-74).

Wilderness and Inventoried Roadless Areas

Project sites (wood source, rock collar landings, and log jam sites) lie to the north, east, and west of the Congressionally designated Buckhorn Wilderness area. No project activities are proposed within the wilderness boundary. The large wood sites within the Gray Wolf River Corridor fall within the Quilcene Unroaded Area (or Inventoried Roadless Area, IRA) (Figure IRA-1).

The 2001 Roadless Rule (36 CFR Part 294) established prohibitions on road construction, road reconstruction, and timber harvesting in inventoried roadless areas on National Forest System lands. The intent of the rule was to provide lasting protection for IRAs in the context of multiple use management. The project activities occurring within the Quilcene IRA (listed as the Quilcene Unroaded Area in the Forest Plan) are not among those prohibited by the 2001 Roadless Rule. Roadless area characteristics include: (1) high quality or undisturbed soil, water, and air; (2) sources of public drinking water; (3) diversity of plant and animal communities; (4) habitat for threatened, endangered, proposed, candidate and sensitive species and for those species dependent on large, undisturbed areas of land; (5) primitive, semi-primitive non-motorized and semi-primitive motorized classes of dispersed recreation; (6) reference landscapes; (7) natural appearing landscapes with high scenic quality; (8) traditional cultural properties and sacred sites; and (9) other locally identified unique characteristics.

Figure IRA-1. Project activities in relation to the Quilcene IRA.



The Quilcene IRA is described in the Forest Plan as a 19,017 acre area extending from near the northern boundary of the Hood Canal Ranger District to the Dosewallips River Road to the south. The area consists of narrow strips of land bordered by the Buckhorn Wilderness to the west and roads and forest land to the north, east, and south. An extensive road system provides access to most of the northern, eastern, and southern boundaries. While portions of the Gray Wolf and Dungeness Rivers flow near the unroaded area, only a very minor portion of the Gray Wolf is included in the area. Project activities are proposed within the Gray Wolf River corridor that overlaps with this portion of the unroaded area.

Potential Wilderness Area Analysis

Because this project is small in scope, highly localized, and contains no activities that would impact the wilderness potential of any area not currently designated as wilderness or IRA, a Potential Wilderness Area analysis was not conducted.

No Action Alternative

Direct, Indirect, and Cumulative Effects

The No Action alternative would not change the current conditions within the IRAs or the Buckhorn Wilderness. Because there would be no project activities, there would be no cumulative effects to IRAs or wilderness characteristics to combine with the effects of past, present, or foreseeable future actions.

Proposed Action Alternative

Direct, Indirect, and Cumulative Effects

No project activities will occur within the Buckhorn Wilderness area, and the project will have no direct, indirect, or cumulative effects on the wilderness area. Considering the size of the IRA, and the very small-scale of the localized project activities within it, project activities will not affect the roadless area characteristics of the Quilcene IRA.

Conclusion

There are no proposed project activities within the wilderness boundary, and no direct effects to wilderness or the Quilcene IRA. Therefore this project would contribute no cumulative impacts to the Quilcene IRA or wilderness areas. The project is consistent with the Forest Plan and current regulations concerning wilderness and IRAs.

Cultural Resources

Introduction

The area of potential effect (APE) for cultural resources consists of two locations: the wood source and where log jams will be placed (See Chapter 2 for maps). The wood will be removed by falling with a chainsaw. The trees will then be flown via helicopter to the log jam locations. No recontouring or heavy machinery is proposed and the log jams will not have an adverse effect on the cutbank but would create local scour pools, sort in-stream sediment, and other elements that improve habitat for Endangered Species Act (ESA) listed salmon, steelhead, and char. The following section discusses the methods for cultural resource surveys, findings of the surveys, and effects of the project on cultural resources. More detailed information including survey areas and photographs can be found in the project record.

Background Research

Environmental

The APE is an area that has undergone logging previously but was once forested with western red cedar (*Thuja plicata*), Douglas fir (*Pseudotsuga menziesii*), and various grasses. However, the understory is now primarily stinging nettle (*Urtica dioica*) and blackberry (*Rubus fruticosus*). Fauna includes deer (*Odocoileus spp.*), elk (*Cervus canadensis*), and variety of smaller land mammals.

Climate in the region is relatively mild. The average maximum temperature is 80°F, an average minimum of 28°F, with a mean of 55°F, and a mean annual precipitation of 18.75 inches (Weather Underground, 2012).

Ethnohistoric

The APE is within the Usual and Accustomed territory defined in Article I of the Treaty of Point No Point (12 STAT 933), which the Jamestown S’Klallam have reserved rights to the resources defined in Article IV of the Treaty. Furthermore, the APE is inside the Jamestown S’Klallam Land Consolidation Area, which is a combination of reservation, fee, and trust lands and properties of interest pursuant to Tribal Resolution 60-82.

Myron Eells, a missionary who was stationed at the Skokomish Reservation between 1874 and 1907 was one of the earliest and most cited contributors to the ethnographic record (Stauss, 2002). Erna Gunther, an anthropologist, later documented the life ways of the S’Klallam in 1924 and 1925 and later followed by William W. Elmendorf in the 1940s. Wayne Suttles and Barbara Lane contributed to the *Handbook of North American Indians: Northwest Coast* and the most recent work was completed by Joseph H. Stauss in 2002 under the direction of the Jamestown S’Klallam Tribe (Stauss, 2002).

Historic Maps

The Washington State Department of Archaeology and Historic Preservation (DAHP) Washington Information System for Architectural and Archaeological Records Data (WISAARD) was used to examine historic geographic land office (GLO) maps. The Smith homestead is noted within the northernmost APE for log placement. However, the areas associated with log placement were inaccessible for conducting cultural resource work. Furthermore, the impact will be within the existing stream channels.

Statewide Archaeological Predictive Model

The Statewide Predictive Model, an element of WISAARD that uses a combination of spatial attributes of known archaeological sites and environmental factors to determine the probability of observing an archaeological site within a given area. The Statewide Predictive Model defined the APE associated with the wood sourcing as being a moderately low risk of encountering an archaeological site. The APE associated with the log placement is defined as being an area of moderately low to moderate risk of encountering an archaeological site.

Previous Archaeological Research

The WISAARD was used to examine previous cultural resources reports and known archaeological sites within a one-mile radius of the APE. A total of eight cultural resource surveys were reported and nine archaeological sites are located within one mile of the APE. Details are available in the project record.

Traditional Cultural Places

There are no known traditional cultural places (TCPs) within this area. Although the area in general has been used since time immemorial by S'Klallam hunters and gatherers, the proposed undertaking will have a negligible impact to tribal hunting and gathering rights. Furthermore, this report was submitted to the Cultural Committee of the Jamestown S'Klallam Tribal Council.

Field Methods

Pedestrian Survey

A pedestrian survey of the ground surface as conducted in areas that could be accessed by foot. The areas associated with the log placement would require a stream-crossing, making it inaccessible for a pedestrian survey (and subsurface testing). Some areas were already disturbed prior to this effort and therefore omitted from the survey and testing. Points of interest were mapped using a Trimble GeoExplorer 6000 Series XH handheld global positioning system (GPS) receiver with a stadia rod and Hurricane antenna, which provided sub-meter horizontal accuracy. Photographs were captured using a Nikon AW1100 CoolPix digital camera.

Subsurface Testing

Subsurface testing was conducted using a 10-centimeter diameter bucket auger to an impenetrable depth in accessible areas. Vegetation and wood debris made completing subsurface testing at a systematic interval impossible. Soil matrix was screened through ¼ inch steel mesh.

Results

Pedestrian Survey

No cultural material was encountered through the pedestrian survey. Ground visibility was 0% as a result of vegetation. The understory was heavily disturbed because of previous logging (3rd generation). The fly yard was barren and ground visibility was 100%. The ground surface was primarily compact gravel. No significant cultural material was located within the fly yard and it has been used for target shooting for several decades.

Subsurface Testing

A total of nine subsurface tests were completed within the wood source APE. No cultural material was encountered through the testing effort.

Conclusion and Management Recommendation

No significant cultural material was encountered through this effort. As noted throughout this document, a systematic coverage of the APE was impossible because of vegetation and access to the log jam placement locations. However, given the proposed undertaking and the

previous impacts to the landscape, this project can be completed as it is proposed and it will have no impact to cultural resources pursuant to federal and Washington State laws.

Climate Change

Potential Effects of Climate Change on the Proposed Action

A growing body of scientific evidence and long-term climate modeling indicate that climate change is occurring at a global scale, and that it is associated with increased outputs of carbon dioxide (CO₂) and other greenhouse gases (GHGs) resulting from human activities. Mote and Salathe (2009) used a wide range of climate models to explore possible future climate scenarios for the Pacific Northwest. All models indicate that the future climate will be warmer than the past, with rates of warming greater than those observed in the 20th century. Model projections for precipitation are much more uncertain than those for temperature, and remain within the 20th century range of annual variability (Mote 2003). There are others who believe that climate change is not occurring or that, if it is, it is not a result of human activity. They cite evidence such as a downward trend in temperature in the last decade (1998-2009) as a reason to question climate models that predict steady long-term increases in temperature.

This analysis focuses on aspects of climate change that may lead to changes in the effects, sustainability, vulnerability, and design of the proposed action and its alternatives. It recognizes the limits of our scientific ability to accurately predict climate change effects, and does not devote effort to analyzing wholly speculative effects. It follows the Council on Environmental Quality's (CEQ) regulations at 40 CFR 1502.22 regarding acquisition and disclosure of information that is relevant to reasonably foreseeable impacts and is essential to a reasoned choice among alternatives.

This project was not specifically designed to respond to or mitigate potential climate change. This analysis will consider two types of climate change effects: the effect of climate change on the proposed action; and the effect of the proposed action on climate change. Because these are complex issues, large-scale issues, and there are no fine-scale models available to provide meaningful project-level information, this is not a quantitative analysis.

Potential Effects of Climate Change on Hydrology

Because this project involves the installation of log jams within the stream channel, the most pertinent potential effects of climate change on the project are potential changes to stream flows that might occur as a result of changes in precipitation and snowpack, the timing of snow melt, or both. Model projections in the document *Climate Change, Hydrology, and Road Management on the Olympic Peninsula* (Halofsky et al. 2011), show increased air temperatures will affect snowpack and timing of streamflow. Increased temperatures are predicted to result in more precipitation falling as rain rather than snow in the winter and earlier snowmelt. The greatest reductions in snowpack are expected for lower elevations (<3,280 feet). This will increase winter and spring streamflows and reduce summer flows. Precipitation in the Dungeness watershed is generally low due to the rain shadow effect from the Olympic Mountains, and this contributes to natural low flows in the summer.

Changes in precipitation will affect streamflow and the frequency and magnitude of flood events. It is recognized that model projections for precipitation are much more uncertain than those for temperature. Projections for seasonal precipitation changes show increases in winter precipitation and decreases in summer precipitation. Increased cool season precipitation is projected to lead to increases in runoff. Precipitation intensity is also projected to increase, with greatest increase in flood magnitude and frequency predicted in December and January.

Shifts in hydrologic processes resulting from predicted increased air temperatures and changes in precipitation will likely impact physical watershed processes in a number of ways. Increased precipitation and storm intensity could lead to increased rate and volume of water delivery to channels, increased mass wasting and debris flows, and increased sediment and wood delivery to streams. Increased winter and spring flow volume in streams could lead to increased floodplain inundation, increased channel migration, and increased channel erosion and scour.

Management Considerations for this Project

The log jams proposed in this project have been designed to imitate naturally occurring log jams and complexes. They would help restore a naturally functioning, complex, and resilient habitat within the treated stream reach. Structure designs are based primarily on the predicted Q100 or the peak flood flow that would be expected to occur once every 100 years. The structures are over-designed with a factor of safety of more than 4 to account for unanticipated events and unusual sheer stresses or log buoyancy factors (see Appendix A for further details).

Potential Effects of the Proposed Action on Climate Change

While the log jams proposed in this project are intended to influence the formation of fish habitat and restore some of the riverine functions associated with large stable log jams, they would not have any effects on the timing and volumes of peak flows, nor would they influence any potential effects of climate change on hydrology.

The use of petroleum-fueled equipment associated with the transport and placement of logs for this project would consume fossil fuels and contribute CO₂, a greenhouse gas (GHG) to the atmosphere. Although the release of GHGs are local events, their effect on climate change occurs at a global scale. Because of this, it is impossible to precisely assess the potential effects of the Dungeness Large Wood Enhancement Project, and even relative comparisons between the alternatives are meaningless on a global scale.

The proposed harvesting and transport of approximately 120 trees by helicopter may result in a short-term, localized increase of GHG releases, but this effect would be undetectable at any meaningful scale. The helicopters, trucks, and other machinery used to implement this project would not represent an increase in the overall number of vehicles consuming fossil fuels or the amount of GHGs produced, because if the project were not implemented (as in the No Action alternative) these vehicles would probably be in operation on other projects.

Global climate change has been described as the ultimate cumulative effect, overlapping in space and time with countless other human actions across the entire earth in the past, present,

and the foreseeable future. Its extent is worldwide, and it affects different geographical regions differently. On a global scale, the Dungeness Large Wood Enhancement Project is likely to have a negligible cumulative effect on climate change.

Other Effects and Mandatory Disclosures

Clean Air Act

This project does not propose any burning or other activities that would affect air quality. This project is in full compliance with the Clean Air Act.

Forest Plan Consistency

The analysis performed by the interdisciplinary team found that the actions proposed under both project alternatives are consistent with the Forest Plan. The project's Purpose and Need are consistent with Forest Plan goals and objectives, and impacts to resources as evaluated in this EA are consistent with Forest Plan direction and standards and guidelines.

National Forest Management Act Compliance

Compliance with the National Forest Management Act (NFMA) can be demonstrated by finding that a project is consistent with the following applicable requirements of 16 USC 1604(g)(3):

(g)(3)(A): insure consideration of the economic and environmental aspects of various systems of renewable resource management, including the related systems of silviculture and protection of forest resources, to provide for outdoor recreation (including wilderness), range, timber, watershed, wildlife, and fish.

This project would be primarily funded through grants. The project has benefited from a strong collaborative effort through proposal development and refinement, and the identification and pursuit of diverse funding sources. The project would bring some economic activity and jobs to the local area for the duration of project design and implementation. This Environmental Assessment (EA) also considers the effects of implementing the alternatives on environmental aspects of the planning area. This consideration includes the forest resources of recreation (including Wilderness), watershed, wildlife, and fish.

(g)(3)(B): provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives, and within the multiple-use objectives of a land management plan adopted pursuant to this section, provide, where appropriate, to the degree practicable, for steps to be taken to preserve the diversity of tree species similar to that existing in the region controlled by the plan.

The actions proposed provide for a diversity of plant and animal communities within the project area as described in the multiple-use objectives of the Forest Plan. The effects to plant and animal communities are described in the resource sections of this chapter of the EA.

(g)(3)C: insure research on and (based on continuous monitoring and assessment in the field) evaluation of the effects of each management system to the end that it will not produce substantial and permanent impairment of the productivity of the land.

Implementation monitoring and other monitoring proposed in this document would provide an evaluation of the effects of implementing any of the project alternatives.

Irreversible Commitment

Irreversible impacts result from the use or modification of resources that are replaceable only over a long period of time.

Soil productivity would be lost to some degree on equipment access and skid trails due to soil displacement, although measures to reclaim these areas would speed recovery. There are no other irreversible commitments associated with the proposed action.

Irretrievable Commitment of Resources

Irretrievable commitments are opportunities for resource uses that are foregone because of decisions that use that land in another way.

There are no irretrievable commitments of resources.

Adverse Effects That Cannot Be Avoided

Implementation of the action alternative would result in some adverse environmental effects that cannot be avoided. For example, the use of equipment and skid trails as well as the use of Forest Service roads would cause some soil disturbance. The magnitude of these effects relative to the entire project would be very small, and would remain within prescribed standards and guidelines. The degree of these adverse effects would be minimized through the project's required design criteria and mitigation measures, described in Chapter 2 of this EA.

Relationship to Other Agencies and Jurisdictions

The Washington State Department of Ecology (Ecology) is responsible for enforcing the Clean Water Act of 1972. A memorandum of Understanding between the Forest Service and Ecology states that Best Management Practices used by the Forest Service to control or prevent non-point sources of water pollution will meet or exceed Washington State water quality standards.

The Department of Ecology is also responsible for enforcing the Clean Air Act of 1972.

Endangered Species Act

The United States Fish and Wildlife Service (USFWS) is responsible for the protection and recovery of Threatened and Endangered Species. The effects to species resulting from this project are consistent with those effects described in the Endangered Species Act-Section 7

Programmatic Consultation Biological Opinion for Aquatic Restoration Activities in the States of Oregon, Washington, and parts of California, Idaho, and Nevada (ARBOII).

The National Oceanic and Atmospheric Administration (NOAA) is responsible for the protection and recovery of Threatened and Endangered marine fish species. The effects to species resulting from this project are consistent with those effects described in the Endangered Species Act-Section 7 Programmatic Consultation Conference and Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Essential Fish Habitat Response for Aquatic Restoration Activities in the States of Oregon and Washington (ARBOII).

No cultural resources were located during surveys for this project. If any cultural resources are encountered during project implementation, Cultural Resource Site reports for all cultural resources found would be filed with and approved by the Washington State Historic Preservation Officer. The Washington State Department of Archaeology & Historic Preservation concurred with the Forest Service determination of No Historic Properties Affected (letter dated November 10, 2014).

Effects on Prime Farm Land, Range Land, and Forest Land

There are no prime farm lands or prime range lands associated with the Dungeness Large Wood Enhancement Project. The project would not convert forested lands to other uses.

Potential or Unusual Expenditures of Energy

There would be no unusual energy requirements associated with the proposed action.

Effects on the Human Environment

While the design and construction of the log jams would create or sustain jobs, no quantitative output, lack of output, or timing of output associated with implementation of the proposed action would affect the civil rights, privileges, or status quos of consumers, minority groups, women, or American Indians.

For public safety reasons, several the Forest Service roads that are frequently used by the public would need to be closed during helicopter transportation of logs to the project reaches, and the affected reaches of the river would be closed to recreational use during project implementation. Proper road closure and/or signing for safety would follow the Manual in Uniform Traffic Control Devices for Streets and Highways. There would be no adverse effects to human health or safety associated with the implementation of any alternative for this project.

Effects on Wetlands and Floodplains

There would be no filling in of wetland or floodplains, and all project activities would be conducted in compliance with the Army Corps of Engineers permit and the Hydraulic Project Approval permit issued by WDFW for the project. Given the mitigation measures and design requirements included in the proposed action, there would be no adverse effects to or floodplains or wetlands from the implementation of the project.

Effects on American Indians

The Dungeness Large Wood Enhancement Project planning area lies within the area ceded to the United States by the 1855 Point-No-Point Treaty. The project was developed in conjunction with the Jamestown S’Klallam Tribe. The Jamestown S’Klallam Tribe Lower Elwha S’Klallam Tribe and Port Gamble S’Klallam Tribe were formally consulted regarding the project in a letter dated August 27, 2014. No concerns about the project’s potential effects were raised by the Tribes.

Effects on Cultural Resources

No known historic and cultural sites are located within the areas proposed for project activities. Given the requirement for cessation of project activities if cultural resources are discovered, followed by an evaluation by a Forest Service Archaeologist, there would be no adverse effects to cultural resources from the implementation the project. The Washington State Department of Archaeology & Historic Preservation concurred with the Forest Service determination of No Historic Properties Affected (letter dated November 10, 2014).

Environmental Justice

Environmental Justice means that, to the greatest extent practicable and permitted by law, all human populations are provided the opportunity to comment before decisions are rendered, are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner, by government programs and activities affecting human health or the environment.

One goal of Executive Order 12898 is to provide, to the greatest extent practicable, the opportunity for minority and low-income populations to participate in planning, analysis, and decision-making that affects their health or environment, including identification of program needs and designs. The Executive Order makes clear its provisions apply fully to programs involving Native Americans.

Analysis for the Dungeness Large Wood Enhancement Project has been conducted under Departmental regulation 5600-2, December 15, 1997, including the Environmental Justice Flowchart, and CEQ’s Environmental Justice – Guidance Under the National Environmental Policy Act. The project’s proposed action, purpose and need, and area of potential effect have been clearly defined. Scoping under NEPA has utilized extensive and creative ways to communicate. Consultation with Native American Tribes has taken place.

The proposed action and its alternatives do not appear to have a disproportionately high or adverse effect on minority or low income populations, or on American Indian Tribes. The proposed action and alternatives do not have disproportionately high and adverse human health effects, high or adverse environmental effects, substantial environmental hazard, or effects to differential patterns of consumption of natural resources. Scoping did not reveal any issues or concerns associated with the principles of Environmental Justice. In some areas of the Forest, the gathering of special forest products, particularly of salal and mushrooms, is an activity where there is the potential to disproportionately affect minority populations, but

this is a very minor use within the project area. All interested and affected parties would continue to be involved with the comment and decision-making process.

CHAPTER 4 – LIST OF PREPARERS AND AGENCIES CONSULTED

Issues associated with the Proposed Action were identified by an interdisciplinary team through an extensive scoping process. This process included a review and evaluation of information gathered through specialist input, and ongoing public involvement and correspondence until a decision is determined.

A team of Olympic Forest Service employees has conducted preliminary analysis, development of a Proposed Action and subsequent action alternatives, and environmental analysis for the Dungeness Large Wood Enhancement Project. The makeup of the team was based upon the action being proposed and the expected effects of the proposal on other resources and values. Members and contributors to this team are listed below.

Table 4-1. IDT Members and Contributors	
Dean Yoshina	Responsible Official
Marc McHenry and Bob Metzger	Project Leads
Karen Holtrop	Wildlife Biologist
Alex Weinberg	Recreation Specialist
Justin Urresti	Soil Scientist
Mark Senger	Silviculturist
Kim Crider	NEPA Specialist
Cheryl Bartlett	Botanist and Invasive Species Specialist
Stephanie Neil and Gideon Cauffman	Cultural Specialists

Following development of the Proposed Action, scoping letters were distributed to the general public and to the following recognized Tribes, and other Federal and State agencies listed below. Any responses from these parties were considered and incorporated into: further refinement of the Proposed Action, development of action alternatives and/or analysis of environmental effects. More detailed information may be found in the Dungeness Large Wood Enhancement Project analysis files.

Table 4-2. Agencies and Tribes Consulted
Jamestown S’Klallam Tribe
Port Gamble S’Klallam Tribe
Lower Elwha S’Klallam Tribe
National Marine Fisheries Service
U.S. Fish and Wildlife Service
Washington Department of Ecology
Washington Department of Fish and Wildlife
Washington State Department of Archaeology and Historic Preservation

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